Industrial Engineering and Management

Industry Evolution

Empirical Studies on Discontinuities

Mirva Peltoniemi (Ed.)

Aalto University | SCIENCE + TECHNOLOGY | REPORT

Aalto University publication series
SCIENCE + **TECHNOLOGY** 22/2013

Industry Evolution

Empirical Studies on Discontinuities

Mirva Peltoniemi (Ed.)

Aalto University
School of Science
Industrial Engineering and Management
Institute of Strategy

Aalto University publication series
SCIENCE + **TECHNOLOGY** 22/2013

ISBN 978-952-60-5348-6 (pdf)
ISSN-L 1799-4896
ISSN 1799-4896 (printed)
ISSN 1799-490X (pdf)
http://urn.fi/URN:ISBN:978-952-60-5348-6

Unigrafia Oy
Helsinki 2013

Finland

Foreword

Industry evolution research aims at explaining changes in key industry variables, such as firm numbers, production volume and dominant innovation activities, as the industry ages. Moreover, the interest is on explaining why some firms survive while others fail. The course Industry Evolution has been in the syllabus of the Department of Industrial Engineering and Management at Aalto University / Helsinki University of Technology since 2005.

The present publication comprises a selection of graduate student course assignments from the Spring term of 2013 when the course was lectured by the editor of this publication. The theme of this year's assignments was discontinuities.

First, the studies by Leppä et al. and Forss et al. focus on technological discontinuities. The prior concentrates on the emerging regulation relating to passive houses, how different types of legitimacy evolve over time and how that affects entry to the industry. The latter analyzes the 3DTV industry and the relationships between firm size, pre-entry experience and patenting.

Second, the studies by Mäkelä et al. and Hukkinen et al. examine discontinuities in regulation. The first focuses on the legalization of online casinos and examines differences in the dynamics of and in the success factors of firms in traditional and online gambling. The second looks into the tightening regulation of the oral tobacco industry and how that relates to changes in the population of firms producing oral tobacco.

Third, the study by Guillaud et al. look into a discontinuity brought about by a new online business model. They analyze the crowdfunding of video games. They compare the content produced via the traditional model and the crowdfunding model, and look into the success factors of crowdfunding ventures.

I believe that these empirical studies offer interesting insights for management scholars as well as for practitioners operating in these industries.

In Espoo, Finland, May 2013,

Mirva Peltoniemi

Contents

Ecological legitimacy of UK passive house designers industry

Rosmarie Leppä, Henri Passila and Jari Vanhanen

ABSTRACT

This research is the coursework for Industry Evolution course at Aalto University School of Science. The focus of this research is to investigate passive house designer firms in the UK from organizational ecology perspective. Main question to answer is if passive house designer population shows signs of legitimacy and if its growth can be justified by the concept of ecological legitimacy. For the research we used database of certified passive house designers and certified buildings. We also did an article review to study consumer awareness and acceptance. The research shows that internal legitimacy of the passive house designer population is increasing as well as number of firms in the business. We also found out that externally professional awareness and sociopolitical legitimacy have increased in the passive house industry. On the other hand, consumer awareness could not be said to have increased.

Keywords: passive house, organizational ecology, ecological legitimacy

1. Introduction

Legitimacy is a key concept of organizational ecology (Baum and Shipilov, 2006). The concept has been devised to allow researchers address the issue of how established an industry is. Originally, population legitimacy was measured by analyzing density dependence i.e. the number of firms in the population (Hannah and Freeman, 1977) but since legitimacy has been viewed from an external perspective. For example, authors have noted that legitimacy could be regarded to be influenced by institutions (Meyer and Rowan, 1977; Powell and DiMaggio, 1983) or as a cultural phenomenon (Zucker, 1977). As the studying of legitimacy has extended from the density dependence model (Baum and Shipilov, 2006) to cover social, political and psychological dimensions (Aldrich and Fiol, 1994), the methodological possibilities have accordingly diversified.

The passive house concept originates from Germany (Passive House Institute, 2012a). According to the International Passive House Association (2010), the first passive houses were built on in the beginning of the 90s in Darmstad Germany and the Passive House Institute founded on 1996. Also, the statistics are encouraging – the passive house technique started to bloom after the change of Millenium and there were 6000 passive houses buildings in Germany in 2006 (see fig. 1).

The Passive House Planning Package (PHPP) is software tool that facilitates the planning and building of houses according to the passive house standard which was originally available in German (Passive House Institute, 2012b). However, especially the Cepheus program, an EU passive house promoting from 1998 to 2001 (www.cepheus.de.eng), encouraged the translation of

Figure 1. Growth of passive houses in Germany. Source: gse.cat.org.uk

material increasing awareness of the standard in other countries. According to the Passive House Institute (2012c) publication list the PHPP has been translated in 2007 for the first time. This means that the passive house designer industry in the UK has emerge from an unusual setting where the certification system has already been established and gained legitimacy in another market. The lingering German heritage of the passive house movement is illustrated by the way that the German term "passivhaus" interchangeably with "passive house" in the UK passive house industry. In addition to house certifications, the Passive House Institute also certifies building material and individuals as passive house tradespeople and passive house designers (Passive House Institute, 2012d). This exposes the interconnected nature of different populations behind the emergence of the passive house industry.

In this research, our focal point will be the passive house designer industry in the United Kingdom where the passive house movement started in the late 00's. More precisely, we will focus on UK-based designer firms that have a certified passive house building. For specifics on the certification process of buildings see appendix 1.The official passive house building certifiers are Building Research Establishment (BRE), Cocreate Consulting and Warm – Low Energy Building Practice (Passive House Institute, 2012e)

1.1 Definition of a passive house

The word house might be misleading in the concept of passive house. It must be clarified that a passive house is any building built according to the prevalent PHPP standard. For example, school buildings, office buildings and even a vicarage have received the passive house certification in the UK. The buildings are certified according to the passive house standard. Briefly, the main technical criteria for a passive house certification are as follows:

- Space Heating Demand
  $\leq 15\ kWh/(m^2a)$
- Building Heating Load
  $\leq 10\ W/m^2$
- Useful Cooling Demand
  $\leq 15kWh/(m^2a)$
- Primary Energy Demand
  $\leq 120\ kWh/(m^2a)$
- Building Air-tightness
  $\leq 0.6\ ac/h^{-1}$
- Excess Temperature Frequency
  $\leq 10\%$
  (Passive House Institute, 2012f)

In essence, the standard aims to reduce energy consumption, by reducing the amount of energy lost from the house. This can, for example, be done by reinforcing windows. In other words, a passive house means a building that has been built so that it loses less energy than traditional building. This makes the building more economical. In addition to new builds, old buildings might be "retrofitted" i.e. transformed to fit the passive house standard (Passive House Institute, 2012g).

1.2 Research Scope

In this research we will focus on the architecture firms designing passive houses in the UK. We will delineate the focal population as:

all designer firms that have designed at least one building that has received a passive house certification before year 2013.

Even though buildings are often projects with multiple stakeholders, the data about designers is readily available. Our research will cover the firms that have designed buildings that are new builds or retrofits. Naturally, firms, whose buildings have failed to achieve the certification, will be excluded. This is done because there are multiple houses and projects in the UK, which use passive house methods to reduce energy consumption, but are unable to achieve the passive house certification. There are also other standards and certifications concerning the design. Most notably, the world's leading sustainable building certifier BREEAM has so far certified up to 2516 building in the UK compared to 166 passive house certifications (greenbooklive.com, 2013). Needless to say that even with the success in Germany and it seems that at least in Europe, this does not guarantee that it will be the case in the future.

1.3 Research questions

Our objective in this study is to investigate the UK passive house designer firms from the ecological perspective and evaluate the signs of legitimacy of this recently emerged industry. Main questions to answer are:

What signs of legitimacy does the UK passive house designer population show? How can the growth of an industry be described with the concept of ecological legitimacy?

2. Literature review

In this section we will introduce the theoretical foundation concerning the research. After introducing the relative articles, a conceptual framework will be devised as a lens for the empirical research.

2.1 Ecological approach to organizational ecology

The organizational ecology theory views industries from an ecological population point of view. The organization ecology scholars Baum and Shipilov (2008) explain that the ecological research considers the firm populations as a whole rather than proposing population wide generalizations based on successful individual firms. The benefit of the ecological research is that it is better versed at addressing the interdependency different organizational populations as well as acknowledging external influences. Hannan and Freeman (1977:93) suggest five possible levels of analysis in ecological research: units within firms, firmss, populations of firms and communities. Baum and Shipilov (2008) further endorse the use of population substructures to improve the soundness of the ecological population-level research. The following substructures have been used in previous research legal form, core technology, customer base, strategy and geographical location (Baum and Shipilov, 2008:61). However, an operationalization of substructure division might be difficult to achieve because generated sub-

structures might result in use of structures that are arbitrary or meaningless (Baum and Shipilov, 2008:61).

The focus of organizational ecology is on the vital rates, i.e. the mortality and founding rates of firms that are derived from comparing the number of foundings or mortality cases to total number of population. Organizational ecology attempts to explain these vital rates by addressing both environmental conditions as well as internal interactions (Baum and Shipilov, 2008). Salimath and Jones (2011:896-878) identify 6 research domains under organizational ecology: organizational founding, organizational mortality, liability of newness, liability of smallness, density dependence and population dynamics. It is common for the organizational approach to utilize ecological terminology is widely used in organizational ecology even though other terms would have been established by other organizational approaches (Amburgey and Rao,1996). For example, the vitality rates do not content wise differ from the entry and exit rates used in ILC theory.

2.2 Legitimacy of Organizational Populations

There are several approaches to understanding ecological legitimacy. Originally the density dependence model was used to estimate legitimacy of a population (Baum and Shipilov, 2006). The density dependence model suggests that as the number of firms increases, the legitimacy of the population increases simultaneously which in turn makes the industry more attractive for new entrants (Hannan and Freeman, 1977). According to the theory, legitimacy will first increase the entry rate but after higher density is reached, competition will make is more difficult to enter or survive (Salimath and Jones, 2011). The disadvantage of the density dependence model is the challenge of operationalizing (Peterson and Koput, 1991). Carrol & Hannan (1989) have claimed that cognitive legitimacy can be estimated through density dependence (Carrol & Hannan, 1989) but other authors (Zucker, 1989) have expresses concerns about this and called for new methods of exploring ecological legitimacy. Also, even when only looking at the entry and exit rates, it has been speculated whether the legitimacy of a population increases differently depending on in which way the population grows. For example, Lange et al. (2009) expressed that firms diversifying or migrating from another field might build the legitimacy more than completely new, inexperienced entrants. Still, the density dependence perspective does allow us to consider the evolution of the actual population to determine general legitimacy and functions as a foundation for further analysis of factors contributing to the legitimacy.

Ecological research has also been investigating other factors than population density such as institutions' role in increasing the legitimacy of a population (McKendrick and Carroll, 2001). The population dynamics states the underlying rationale is that entry and exit rates reflect the available resources (Delacroix et al., 1989). Zucker (1977) claims that legitimation is essentially a cultural phenomenon which is maintained and protects in a collectivistic manner against disruptions. Hannan and Carroll (1995)

consider the meaningfulness of concept of legitimation concluding that there is no need to aim for comprehensiveness. However, as Baum and Shipilov (2008) state that organizational ecology should reflect both adaptive and selective processes even though as Witteloostuijn (2000) mentions ecological research has become a quantitative research method which often focuses on external selective forces. There is also an ongoing discussion about whether legitimacy should be treated as a "proxy" or a "process" (Baum and Shipilov, 2006:88-89). Also, some authors have put more focus on the operationalization of the concept. DiMaggio and Powell (1983) take a mechanism perspective explaining legitimacy through three mechanisms that contribute to firms becoming more similar: coercive, mimetic and normative. The coercive mechanism gains momentum from the external pressure originated from the other firms and the cultural environment as the mimetic mechanism is the voluntary act of imitating a firm in order to cope with uncertainty. The third mechanism is the normative mechanism which refers to professionalization which is affected by increase in formal education and establishment of complex professional networks.

When considering the legitimacy of a population, it is of great importance to consider the level of analysis. Aldrich and Fiol (1994) suggest that legitimacy can be considered on four levels: the firm, within industry, between different industries and institutional. This view can be juxtaposed with the three leveled legitimation categorization of Ruef and Scott (1998:880): "entire organizational populations, individual organizations, or subunits and specialized aspects of organizations". To illustrate difference we can compare the difference between differing levels of analysis in an empirical ecological study on DiMaggio's and Powell's (1983) normative mechanism. On an organizational level would relate to selective recruiting where firms recruit people of certain type or talent resulting isomorphism as on an industry level the issue relates to overall availability of certain professionalism.

It is suggested that a distinction exists between cognitive legitimation and sociopolitical legitimation (Aldrich and Fiol, 1994; see appendix 5). Sociopolitical and cognitive legitimacy are complementary perspectives that together are able to construct a multidimensional view of legitimacy (ibid). However, this suggestion is a posterior categorization; some conceptualizations successfully have elements of both categories (see DiMaggio and Powell, 1983). However, not all models accommodate both views.

2.3 Cognitive Legitimacy

Carroll and Hannan (1989) have used the density dependence to predict the level of cognitive legitimacy. However, their underlying assumption here is that cognitive legitimacy is the only type of legitimacy. Aldrich and Fiol (1994) extend the concept of cognitive legitimation adding more depth from a social psychology. The level of legitimacy can be estimated by evaluating how well the knowledge about the industry has been dispersed in the society and therefore, a high level of cognitive legitimacy means an industry's activities have been taken for granted (ibid).This cognitive perspective asserts that legitimacy stems

from how aware the society is about the industry (Baum and Shipilov, 2006). Shepherd and Zackarakis (2003) discuss cognitive legitimacy in context emerging industries. They state that before an adequate level of customer awareness has reached, firms give priority to strengthening the awareness concerning the product rather than the firm's brand.

Aldrich and Fiol (1994:648) also present considerations about the operational side of the cognitive legitimacy:

> *"One can assess cognitive legitimation by measuring the level of public knowledge about a new activity.The highest form of cognitive legitimation is achieved when a new product, process, or service is taken for granted. An example is the diffusion of knowledge about personal computers-how to use them and how to manufacture them-in the 1970s and 1980s that facilitated the spread of PC use in homes and schools and that helped spawn many start-ups."*

2.4 Sociopolitical Legitimacy

The sociopolitical legitimation considers the external acceptance industry (Aldrich and Fiol, 1994). When considering legitimacy sociopolitical perspective external pressure is seen to place social and institutional expectations on firms (Baum and Shipilov, 2006). Previous work of Meyer and Rowan (1977) can be seen to belong to the social political category. Meyer and Rowan (1977) state that firms should be seen as a part of relational networks and industry norms may aid or hinder the firms in gaining legitimacy in these networks. These norms are introduced externally and arise mainly from three sources: (1) sociopolitical systems making it advantageous to adopt certain type of norms, (2) mandates from collective firms such as legal firms necessitating the adoption certain norms and (3) changes introduced by leading firms attempting to influence their environment. Aldrich and Fiol (1994:648) comment the measuring of sociopolitical legitimation as follows:

> *"One can measure sociopolitical legitimation by assessing public acceptance of an industry, government subsidies to the industry, or the public prestige of its leaders."*

2.5 Conceptual Framework

In this section, we present the conceptual framework (fig. 2) to further explicate the theoretical underpinnings of our research. Our conceptualization attempts to synthesize literature in a manner that produces a meaningful, theoretical lens for research whilst simultaneously addressing the most relevant topics in the legitimacy literature. As realism often lost when operationalizing the density dependence model (Singh, 1993), our research will supplement the density dependence view with an investigation into the cognitive and sociopolitical legitimacy. This way we will be able to provide a more descriptive account of the legitimacy of the UK passive house designer population. The assumption behind our research is that even though growing population density is an implica-

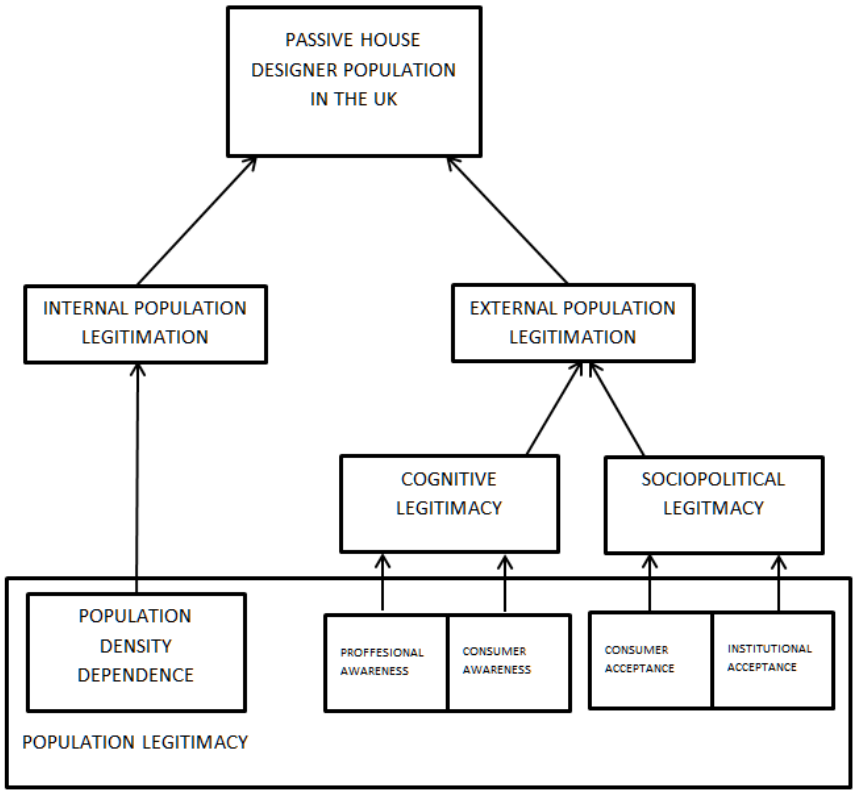


Figure 2. The conceptual framework

tion of growing legitimacy, also studying the legitimacy from the cognitive and sociopolitical perspectives may contribute towards a more meaningful description of the legitimation. Therefore, our research attempts to investigate legitimacy from two main perspectives: (1) how does the population density develop (internal population legitimation) and (2) how does the external environment legitimacy develop (external population legitimation). Using this conceptual framework will also broaden and diversify the use of data sources, thus resulting in an insightful view on legitimacy that will be theoretically sound.

The data about the entries of firms to the passive house designer population, will allow us to investigate the development of the population density. Here, we will focus on the growth rate of the population which is according to the density dependence model a sign of increasing legitimacy. Also, we will consider how this growth will reflect the density dependence literature. The traditional density dependence view is then supplemented with considerations of what we call the external legitimacy. Here we have acknowledged that even though the growing number of firms might indicate growing legitimacy, complementary

views are required to further explore factors behind legitimacy. In our conceptualization we follow the conceptualization of Aldrich and Fiol (1996) who consider the cognitive legitimation as a process of awareness building and the sociopolitical legitimation as acceptance increasing. For this research, specific subcategories were identified to appropriately reflect the research topic. Under cognitive legitimacy, two subcategories were identified: professional awareness that reflects how professionalism concerning passive house designing increases in the ecosystem and consumer awareness which reflects how consumers are becoming increasingly aware of the industry. Under sociopolitical legitimacy, acceptance of both consumers and institutions necessary is investigated to establish where there are signs of increasing sociopolitical legitimacy.

2.6 2.6. Research hypotheses

According to the theory presented above, population density is one key factor relating to organizational legitimacy. To study the population's internal legitimacy, we will study the population density of the designer firm population and state hypothesis 1 as follows.

H1: The internal legitimacy of the passive house designer population is increasing

According to our framework the factors outside the population itself contribute to the legitimacy. Cognitive legitimacy describes awareness concerning the industry and its output. This part is evaluated through hypothesis 2.

H2: The cognitive legitimacy of the passive house designer industry has increased

The awareness of the industry is conceptualized to have two factors: the awareness among professionals and the awareness of consumers. Therefore, we will study hypothesis 2 through our two subhypotheses, which are reflect our conceptual framework:

H2.1: The professional awareness has increased in the passive house industry

H2.2: The consumer awareness has increased in the passive house industry

Sociopolitical legitimacy describes the prevailing acceptance of the industry and its output. This part is evaluated through hypothesis 3.

H3: The sociopolitical legitimacy of the passive house designer industry has increased

The acceptance of an industry is conceptualized to have two factors: attitudes of consumer and attitudes of institutions towards passive houses. Therefore, we use in two subhypotheses:

H3.1: The consumer acceptance has increased in the passive house industry

H3.2: The institutional acceptance has increased in the passive house industry

3. Research method

The methodology was developed iteratively together with the conceptual framework and in respect to the available data. Consulting previous empirical work enabled us to build a better understanding about available the methodological options. In their literature review, Amburgy and Rao (1996) mention that the ecological theory has methodological consistency often employing longitudinal studies, most commonly using either time series modeling or rate analyses. However, the outcome and research design of ecological research differs significantly according to the level of analysis and theoretical domain. Also, as pointed out by Hannan and Carroll (1995:541) in their response to Baum and Powell, due to the need for extensive longitudinal data gathering methods, when devising the research strategy, researchers must "compare the likely gains in information with the cost of collecting additional data".

In order to develop a realistic picture about which longitudinal data about the UK passive house industry was accessible, different methodologies and data sources were rigorously investigated. Our chosen main sources of data are as follows:

1. Certified passive houses, found in http://www.passivehouse-international.org. The International Passive House Association offers a map of all certified passive houses (certified before July 2012) utilizing the database of main certification organ Passive House Institute. This data will be crossed checked with Passivhaus trust project map and news feed to supplement and compare. Through these individual passive houses we will be able to track down each the designer firm (excluding architects for two passive houses).
2. Database of in individuals with a passive house designer certification in the UK, found in passivehouseplaner.de website. Most of the designers belong to some firm, so we will be able to derive company data about passive house designer firms as well as construct a comprehensive view about the whole ecosystem.
3. News articles, from three online newspapers in the UK. Every magazine that is used in this research will be thoroughly searched with the words "passive house" and "passivhaus", to understand the whole picture of the industry. The newspapers that we chose are: the Guardian, the Irish Independent and the Daily Telegraph.

The data from the source 1 will be analyzed to establish the entries to the industry. This data can be used to answer our first hypothesis about increasing legitimacy (H1). Our main variable in H1 is the growth of the firm population consisting of designer firms that have designed certified passive house buildings. The entry numbers can be analyzed to reveal potential internal legitimacy.

The data from the source 2 will be analyzed to understand the network around the passive house designer

industry. We will also use the date of certification to analyze how professional expertise is dispersed in the ecosystem. In order to better understand the whole system, we identified meaningful subcategories i.e. subpopulations. This allows investigate how the professional awareness has developed. The data from the source 2 will be mainly used to analyze the increase of professionalism awareness in the industry, which according to our theoretical framework should increase the external legitimacy. The variables in this hypothesis are the number of certified designer firms in the UK as well as the number of certified passive house professionals.

Our third data source is the newspaper articles of the industry that can be used to analyze the cognitive and sociopolitical legitimacies of the industry and hypotheses H2 and H3. We will review articles about passive houses to establish the acceptance and awareness of the passive house industry. The newspapers were chosen to according to appropriate circulation and geographic reach. To access all areas of the UK (England, Wales, Scotland and Northern Ireland), we will be using the following publications: the Guardian, the Irish Independent and the Daily Telegraph. The articles will be qualitatively as well as quantitatively analyzed to investigate the "acceptance" and "awareness" of the passive house industry. Qualitative analysis consists of content analysis as quantitative analysis will be based on categorical measurements.

4. Results

In this section the results are presented together with a discussion on the implications. We will start by presenting findings concerning the internal legitimacy followed by the sections on the external legitimacy; cognitive and sociopolitical legitimacy.

4.1 Internal legitimacy of the population

To find the number of entries to the passive house industry, the designers responsible for the architecture of certified passive houses were listed. All buildings before year 2013 were included. The list included 169 buildings from 52 separate projects in England, Northern Ireland, Wales and Scotland (see appendix 2). These buildings were designed by 39 different firms. According to Lange et al. (2009), these *de alio* entries will contribute more to the legitimacy of an industry than *de novo* or new entries. From these entrants, almost all were *de alio* entrants meaning they were designer firms diversifying into the passive house market (see appendix 3).

In order to get a better view of the development of the population, the incremental and cumulative growth of the population was analyzed. The figure 3 shows the incremental entries in the industry (right y-axis) together with the number of houses that have been built (left y-axis). As can be seen, there has been unsteady incremental growth of the population as predicted by literature on increasing density. We can see from figure 3 that most entries during one time

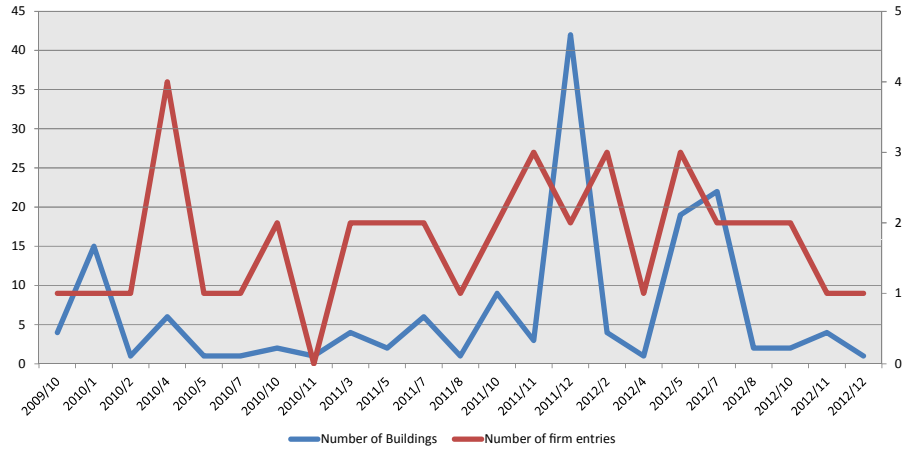


Figure 3. New certified Passive Houses and firm entiries in the UK

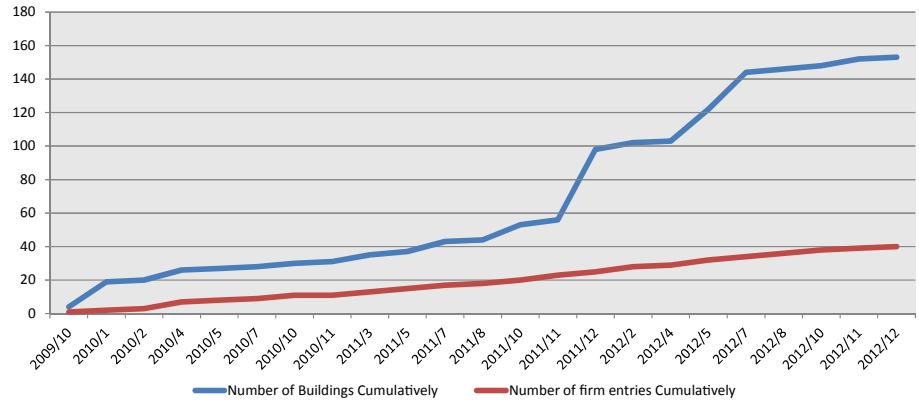


Figure 4. Cumulative increase of buildings and designer firm entries

have been in the April of 2010. However, the number of entries to the industry has increased every year: 2009, 1; 2010, 9; 2011, 14; 2012, 15.

Figure 4 shows the cumulative growth of the population. The cumulative number of firms entering to passive house industry has been growing linearly. According to the theory, as industries gain legitimacy they become more attractive for new entrants. Also, the number of passive houses built will affect the legitimacy of the industry. As can be seen from figure 4, after November 2011, the number of passive houses has increased steeply even though the number of firms has continued to rise. The increase in average number of buildings per firm implies an increased demand for passive houses in the UK market. Interestingly, the designer population has grown steadily between 2009/10 to 2011/10, a period during which the development of

average passive houses per firm seemed to follow a moderate growth trajectory. According to our theoretical framework, these findings indicate that it is possible to state that our first hypothesis:

H1: The internal legitimacy of the passive house designer population is increasing is true. The internal legitimacy of the passive house designer population is increasing as the number of firms is increasing and especially as most of the new entrants are established designer firms.

4.2 Cognitive Legitimacy

To explore the development of cognitive legitimacy of the passive house designer industry, we looked for signs of increased professional awareness as well as consumer awareness.

4.2.1 Professional Awareness

In addition to certifying buildings, the Passive House Institute certifies individual designers. Altogether 218 individuals have received a passive house designer certification in the UK. This data allowed us to develop an elaborate description on how expertise concerning the passive house technique and standard has spread within the UK.

From figure 5 we can see that the number of certifications started booming in late 2010 reaching high numbers than in the years before. However, in 2012 the number of incremental new certifications has come down to the level of beginning of 2010. Figure 6 reveals that the number of certificates has grown quite drastically, considering that the first certifications were made just in late 2009. We can conclude from these figures that the overall professional awareness has increased.

In order to achieve a better view on how the professional awareness has been increased, we analyzed the data on certified designer individuals. Analysis reveals five categories that allow us to investigate the professional awareness from different perspectives:

1. Independent passive house professionals
2. Individuals in a firm that has no marketing for passive house services and can be considered inactive.
3. Individuals in a firm that has offered passive house consultancy.
4. Individuals in a firm that has made designs for passive house buildings, but has no finished or ongoing project.
5. Individuals in a firm that has ongoing or ready project that can be classified as passive house standardized.

Category 1 depicts the independent people that have received the certification, without being enlisted to any firm (fig. 7). Some of these people may have their own independent companies, where they work as a whole employee, but not enough information was found to classify them as passive house consultants. The number in this category reflects 25.6% of the certified designer individuals. However, as there was no link between these people and the actual industry, we can consider this as an indication hype surrounding the industry. In this category, it can also be seen that the 2011 was the best year for passive house certifications.

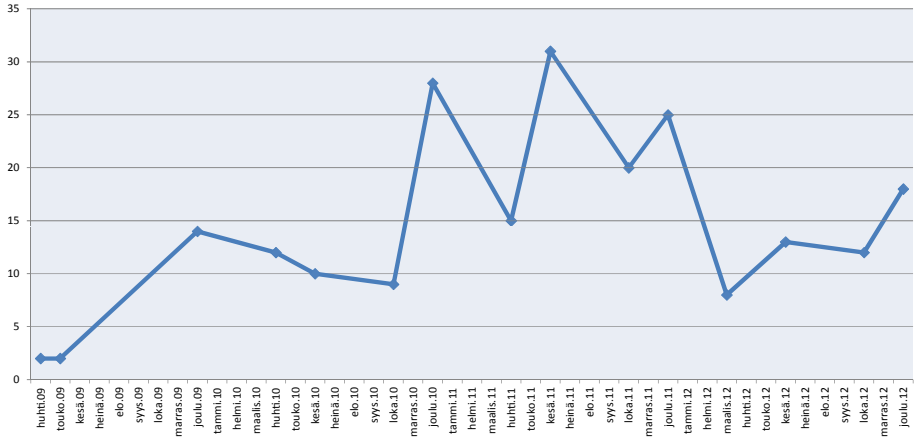


Figure 5: Incremental increase in available passive house expertise in the UK

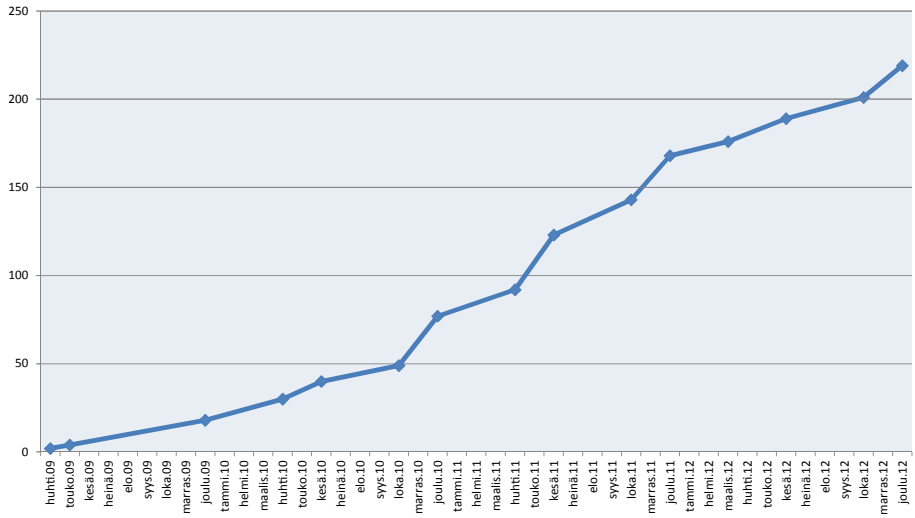


Figure 6: Cumulative increase in available passive house expertise in the UK

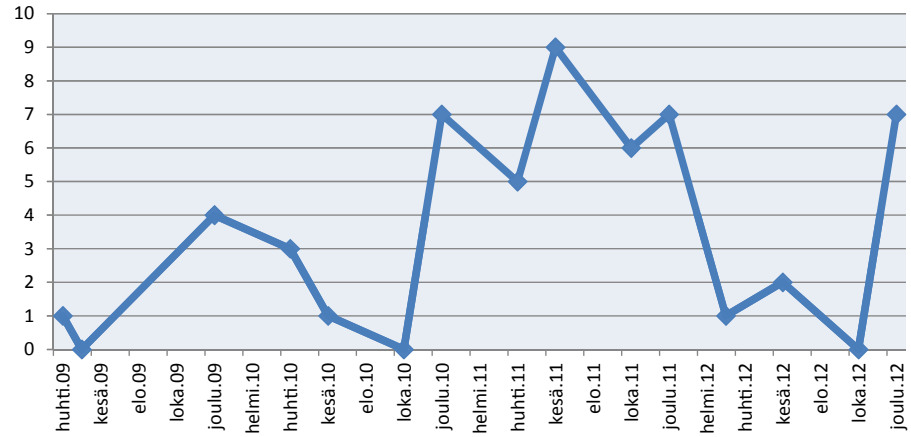


Figure 7: Incremental growth of category 1

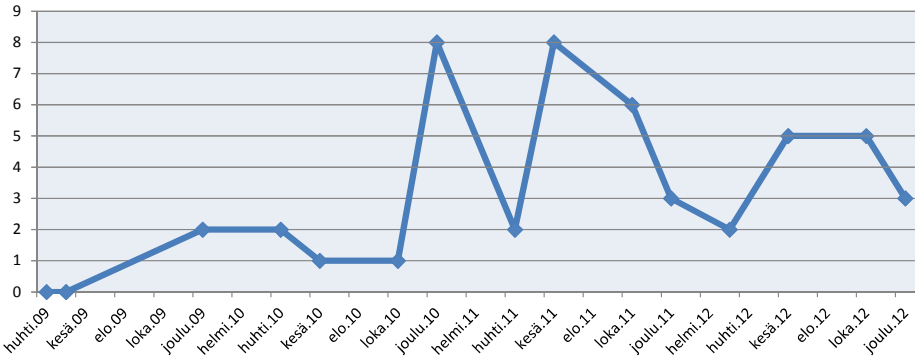


Figure 8: Incremental growth of category 2

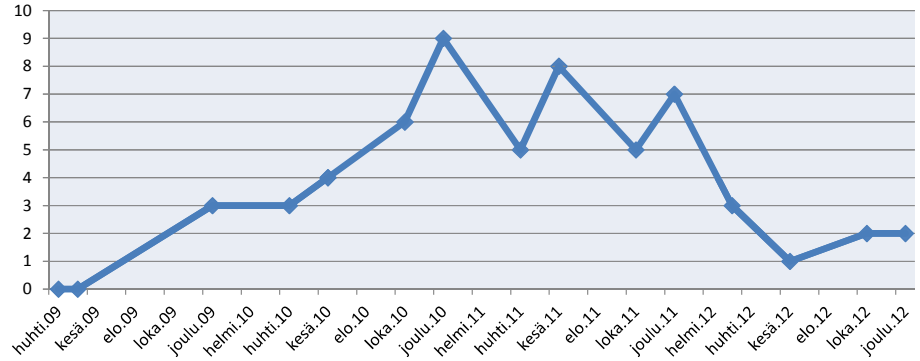


Figure 9: Incremental growth of category 3

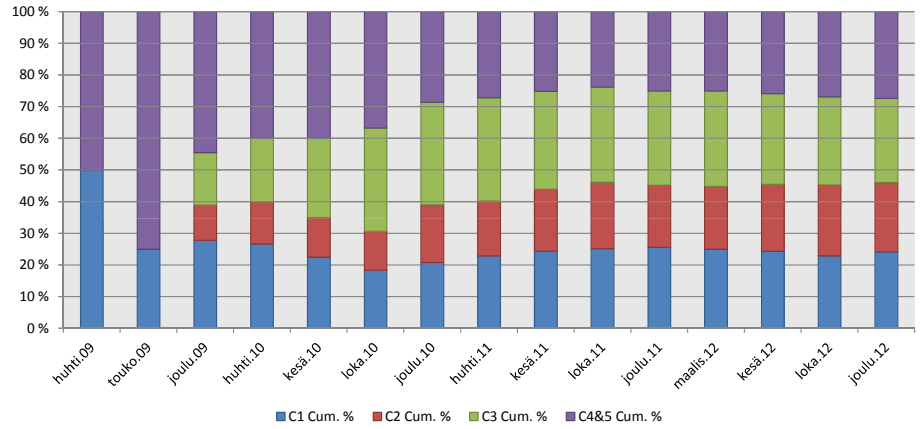


Figure 10: Cumulative division of categories

The category 2 contains people who can be linked to firms, but the firms themselves do not show any activity in the industry. These firms do not publicly advertise passive house services in any manner, but they do have a certified passive house designer in their employee pool. This category reflects 21.8% of all certified designers. The category 2 might also give an indication of larger firms that have not made the transit to become part of the passive house industry, but are somewhat prepared to do that. It also shows that larger firms are also interested in this relatively small industry, so it also enforces the idea of legitimacy. In this category, increases in the number certified individuals can also be found in 2011

Category 3 consists of designers that can be linked to firms that offer passive house consultation, but have not been part of any passive house projects yet (fig. 9). Category 3 is very important for professionalism aspect as it reflects the number of people that are working with passive houses more closely than in categories 1 and 2. The firms, that employ these people believe in this industry more and are often smaller companies that focus only on designing buildings, rather than building them. These certified designers are 26.5% of the whole designer pool, so that also is relatively high number. These firms actively use the expertise, as they are offering passive house consultation and therefore, are part of the industry itself.

In figure 10, we can see that after 2011 the different categories have been grown while maintaining approximately the same proportions. Because different categories have been able to emerge and growth, it seems that passive house as an industry is known within the industry. Also, it attracts individuals, who currently are not working on this field.

From these points that were made in this chapter we can assume that the subhypothesis

H2.1: The professionalism has increased legitimacy in the passive house industry supports the hypothesis 2, as the number of certifications has increased in the industry and ecosystem.

4.2.2 Consumer awareness

According to Aldrich and Fiol (1994), cognitive legitimacy can be investigated by looking into the amount of industry knowledge. Our results in chapter 4.2.1 would indicate that the industry has cognitive legitimacy in terms of professional awareness. However, Aldrich and Fiol (1994) also suggest that cognitive legitimacy should be measured by analyzing public knowledge on the industry.

Figure 11 presents the number of articles on passive houses each year. In this figure, we can see that there has been no increase in the number of articles in last years. However, our research in chapters 4.1 suggests that the industry has grown during the same time span. This would suggest that the industry is not that well-known and that there is not enough awareness about the industry as there is no increase in how often the passive house technique has been discussed in the newspaper articles. Also, to support this, our qualitative analysis on the news articles reveals that passive houses were presented in a similar manner throughout the time frame of our research. Generally, all articles included basic information about passive houses and presented them as somewhat

new innovations. This indicates that the consumer awareness is not so deep yet and has not increased dramatically. These findings are further supported by the analysis of the completed passive houses in 2012, which reveals that many of the newest buildings are still advertised as first passive house build in a certain category (see appendix 4).

With these findings, we are unable to confirm *H2.2: The consumer awareness has increased in the passive house industry.*

As H2.2 could not be confirmed, we are unable to confirm *H2: The cognitive legitimacy of the passive house designer industry has increased.* Although there is a strong indication that the professional awareness has increased, we neither were unable to conclude that there was an adequate level of consumer awareness nor that the level of consumer awareness had increased.

4.3 Sociopolitical legitimacy

According to our literature review, the sociopolitical legitimacy is about the increasing acceptance of the industry. We investigated sociopolitical legitimacy from the perspectives of consumer acceptance as well as institutional acceptance.

4.3.1 Institutional acceptance

The institutional acceptance was considered from two perspectives: the regulation perspective and educational perspective.

According to our qualitative analysis, the regulation perspective was seldom addressed directly in the news articles. Even though the government of UK endorses the voluntary code for sustainable homes in their *Improving the energy efficiency of buildings and using planning to protect the environment* policy(UK Government, 2013), it seems that apart from this there has been no political decisions that would affect the passive house industry. Also, consumer acceptance manifested in proactiveness as some consumers demanded for supportive legislation and tax policies regarding the passive house standard. The main argument for these demands was the high heating costs and ineffective building practices. Some local initiatives were presented, but no effective decisions have been made based on the articles. As the consumer acceptance is creating people to demand better regulative decisions in favor of passive houses, there is indication that institutional acceptance from the regulation perspective might be lagging behind consumer acceptance. However, as there is no indication that the industry is restricted by certain regulations, we can conclude that even though no substantial increase can be found, there is an adequate level of institutional regulatory acceptance.

From the data of individuals with a passive house designer certification, we can conclude that Universities are increasingly interested about the passive house method. In just two years at least the following universities have recruited an individual with a passive house certification: University of Strathclyde, Welsh School of Architecture, South Eastern Regional College, University of Nottingham, university of Exeter, Plymouth University, University of Dundee, University of Bath, Anglia Ruskin University. Also, Professor Gokay Deveci from Gordon University

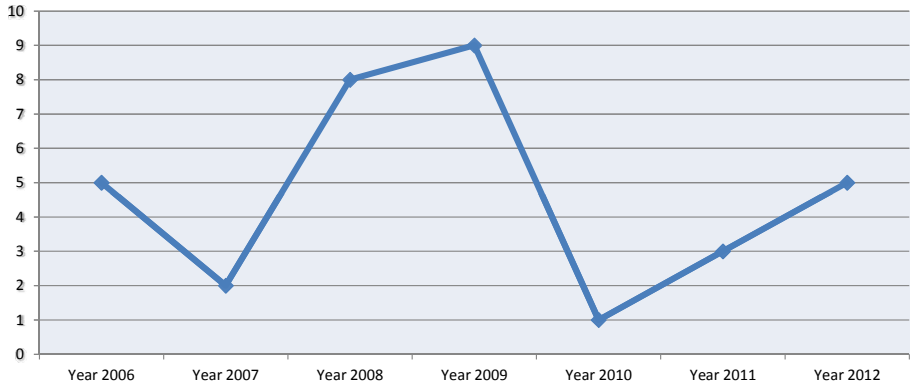


Figure 11. Numbers of newspaper articles by year

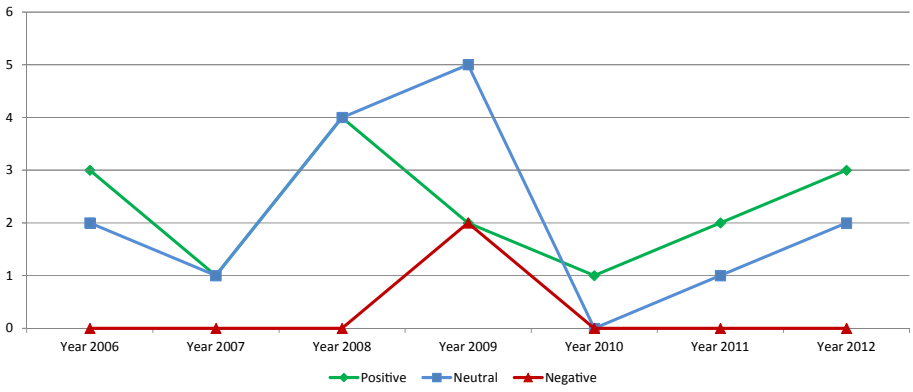


Figure 12. Type of newspaper articles by year

has designed the first two passive houses in Scotland. These findings indicate growing institutional acceptance from the educational perspective.

As it seems that the regulative acceptance is on an adequate level and educational acceptance shows signs of increasing, we are able to conclude that *H3.1: The institutional acceptance has increased in the passive house industry*

4.3.2 Consumer acceptance

According to the article review, the passive house industry was usually presented in a positive (16 articles) or neutral (15 articles) manner (fig. 12). Only two articles showed negative points, one criticizing the price and difficulties of turning old houses into passive houses and one preferring more "active house" standard claiming passive houses were old-fashioned. More often the articles painted a positive image about passive houses by interviewing residents or by sharing reporter's feeling and opinions about the new technology. It was also recognized that current housing is usually poorly insulated which causes high heating costs.

Many residents praised the quality of living and the reduced heating costs. Based on this analysis, *H3.1: The consumer acceptance has increased in the passive house industry* can considered to be true.

Both consumers and institutions seem to accept the passive house industry. As both subhypotheses, H3.1 and H3.2, could be proved, we can state that *H3: The sociopolitical legitimacy of the passive house designer industry has increased* is true.

5. Discussion

In this research we used a conceptual framework that attempts to synthesize concepts of density dependence and external legitimation deriving from cognitive and sociopolitical legitimacy. By using this framework, we were able to diversify the use of data and were able to provide a more realistically sound analysis of the passive house industry in the UK. The results indicated that our framework was appropriately formed as it exposed interesting results concerning the cognitive and sociopolitical legitimacy. Even though the assumption was that both of internal and external legitimacies had been increasing, only the sociopolitical legitimacy could be proved to exist as the results concerning the cognitive legitimacy were somewhat inconclusive. Also, even though Carroll & Hannan (1989) have claimed that the cognitive legitimacy can be measured through density dependence model, we have found evidence to support the use of multidimensional model might provide a more profound description of legitimacy. In our research, while the density of our focal population was increasing, the cognitive legitimacy was not increasing due to gradually developing consumer awareness. This indicates that in future research special attention should be placed on conceptualization of the legitimacy. Also, our research indicates that the cognitive and sociopolitical legitimacy are rather intertwined, so it could be even considered whether the conceptualization should be based the concepts of industry acceptance and awareness rather than the current typology.

The results indicate that passive house industry is growing, as new firms are entering. There is also signs of legitimacy that are especially driven by increased professional awareness. Even though cognitive legitimacy could not be proved to exist, the research was able to highlight that the reason for this is rather the lack of increase in consumer awareness rather than professional awareness. The results also indicate that even though the consumer awareness of the industry increases only slowly, some of the individuals who are aware might even act proactively to increase institutional acceptance and consumer awareness. In addition to the consumer-encouraged legitimacy also firms actively seek to influence the legitimacy. Multiple designer firms endorse the passive house concept separately and more comprehensively than other concepts. For example, firms might have a separate section concerning passive house – rather than selling service they are selling the idea of passive houses. This phenomenon corresponds to the one identified by Shepherd and Zackaraki (2003) that when new industries emerge, it is common that firms build

the legitimacy of new products together. This also supports our findings on the lack of adequate consumer awareness.

It cannot be assumed that passive house standard has successfully penetrated the UK market even though there are signs of legitimation of the industry. However, especially when comparing to Germany where the growth trajectory has been much faster, there is reason to believe that the faith of the passive house standard is still undecided. The existence of various other green building standards might help us to understand the lack of consumer awareness and slow increase in institutional acceptance concerning the passive house technique. These designs differ from each other quite much, and some legislation might promote other standards more than other. For example, the passive house standard is focused on reducing energy used, however, it might be that the especially zero carbon building and BREEAM certified buildings might be perceived as more environmentally-friendly standards that have better synergy with the code for sustainable homes. Also, most of the neutral and negative articles were comments about other standards. These other standards may also affect the image of passive house industry and cognitive legitimacy.

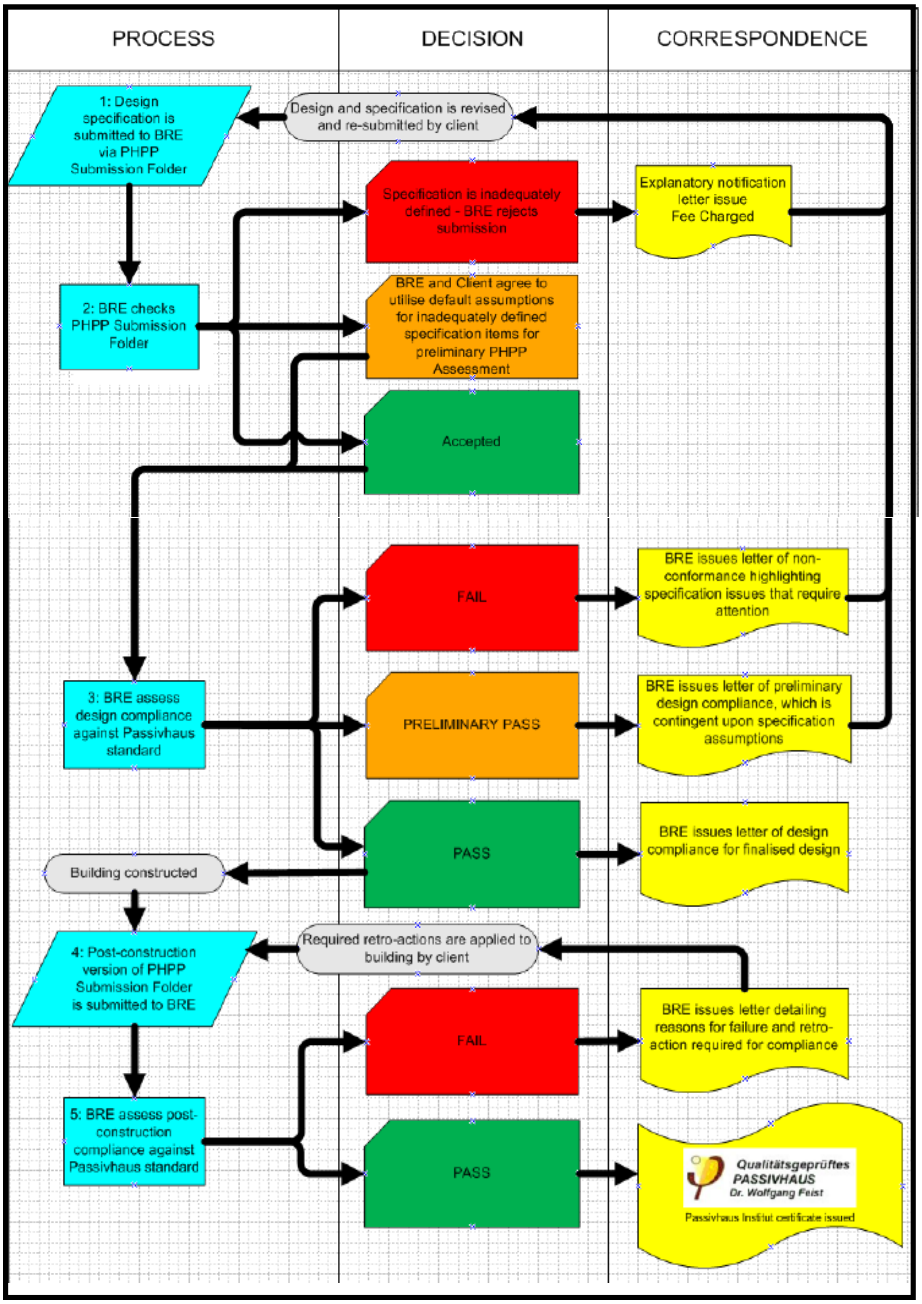
6. Conclusions

In this research, the emergence of the passive house designer population in the UK was studied from an organizational ecology perspective. More specifically, the changes in the legitimacy of the population were investigated. We found out that even though the density of the designer population has been increasing, the external legitimacy seems to have been increasing only partially. Our framework allowed us to identify that especially consumer awareness has been increasing only at a gradual pace and that even though the institutional acceptance seems to be of an adequate level, there are no real signs of increase. Our research also indicates that the concept of ecological legitimacy might be appropriate in industry analysis but to gain a deeper understanding on the legitimacy of a population, it should be considered whether the theoretical framework should be extended beyond the density dependence model.

The most important topic for future research would be to conclusively research the cognitive legitimacy of passive house designer industry in the UK. As Aldrich and Fiol (1994) pointed out, public awareness can prove cognitive legitimacy, so future research could focus on in-depth analysis of consumer awareness. Also, the trend of "green" building could be further investigated to determine how these standards differ from one another. These standards could be approached through the ILC theory and from the dominant design perspective. Also, if the passive house standard was to falter in the UK in the future, this could provide an interesting case study of an established building standard from one country would become a niche solution in another market. Also, at the time of the research, exit data was not available, but if it could be derived in the future, analyzing competition and exits in the passive house industry could help to identify at what stage the industry is.

Appendices

Appendix 1: The certification process of a passive house.



Source: Adam Gravely, BRE http://www.buildingcentre.co.uk/Adam_Gravely_Passivhaus_Presentation.pdf

Appendix 2: Table of passive houses in the UK

	Total	England	Ireland	Wales	Scotland
All Passive Houses	169	117	6	7	28
Number of housing projects	52	39	2	4	7

Appendix 3: Table of passive house designer firms

Name of firm	Type of Entry	House type	Number of units	Date of certification	Location
_space group	De Alio	Non-residental	1	2012/10	England
Archid Architects	De Alio	Residental	1	2012/4	Scotland
Architype	De Alio	Non-residental	1	2012/2	England
Associated Architects	De Alio	Residental	1	2011/11	England
Baily Garner	De Alio	Residental	5	2011/7	England
Bere:architects	De Alio	Residental	1	2010/4	England
Ashlett Naftel	De Novo	Residental	1	2012/8	England
Conker Conservation	De Alio	Non-residental	1	2012/2	England
CPMG Architects	De Alio	Non-residental	1	2011/11	England
Devereux Architects	De Alio	Residental	25	2011/12	England
Dudley Marsh Architects	De Alio	Non-residental	1	2011/8	England
Eco Design Consultants	De Alio	Residental	1	2012/8	England
EDC Architects	De Alio	Residental	1	2011/5	England
Eurobuild	De Alio	Non-residental	1	2010/10	England
Gaia Architects	De Alio	Residental	1	2012/10	Scotland
Gale&Snowden Architects	De Alio	Residental	2	2012/7	England
Green Building Store	De Alio	Residental	1	2010/4	England
Green Tomato Energy	De Alio	Residental	1	2011/3	England
GWP Architecture	De Alio	Residental	2	2010/4	England
Hanse House	De Alio	Residental	1	2011/5	England
Hawkes Architecture	De Alio	Residental	1	2010/7	England
Helen Seymour-Smith Architects	De Alio	Residental	1	2010/2	England

Hyll-Sylde Design	De Alio	Residental	1	2012/11	Ireland
ID Partnership	De Alio	Residental	1	2012/5	England
jpw Construction	De Alio	Residental	1	2009/10	Wales
Kennedy Fitzgerald Architects	De Alio	Residental	5	2012/5	Ireland
Locate Architects	De Alio	Residental	1	2011/11	Scotland
Miller Hughes Architects	De Alio	Residental	12	2012/5	England
Mitchell Architects	De Alio	Residental	20	2012/7	England
NPS	De Alio	Non-residental	1	2012/2	England
Oliver&Robb Architects	De Alio	Residental	1	2010/10	Scotland
Parsons & Whittley Architects	De Alio	Residental	14	2011/12	England
Passivhaus Homes	De Novo	Residental	1	2011/10	England
Paul Davies + Partners	De Alio	Residental	1	2011/3	England
Pentan Partnership Architects	De Alio	Residental	1	2011/7	Wales
Professor Gokay Deveci	De Novo	Residental	15	2010/1	Scotland
Richard Dudzicki Associates	De Alio	Non-residental	1	2012/12	England
Simmonds Mills	De Alio	Non-residental	2	2010/4	England
White Hill Design Studio	De Alio	Residental	8	2011/10	Scotland

Appendix 4: New buildings in 2012

Date of Certification	Location	Location	Building advertised as
2012/2	Exeter	England	One of the three first schools in UK
2012/2	Wolverhampton	England	One of the three first schools in UK
2012/2	Wolverhampton	England	One of the three first schools in UK
2012/2	Canterbury	England	First industrial building
2012/4	Angus, Dundee	Scotland	Bivvi 'passive house'
2012/5	Horsham	England	Sustainable home certification in addition to passive house certification
2012/5	Leeds	England	Fourth school in the UK.
2012/5	Warwickshire	England	Second retrofit in the UK

2012/5	Dungannon	Ireland	First passive house in Ireland
2012/8	Milton Keynes	England	One of the most airtight buildings in the UK
2012/8	Channel Islands	England	First in the Channel Islands
2012/7	Cornwall	England	First standard affordable passive house scheme in the UK
2012/7	Exeter	England	First social housing passive house
2012/10	Leeds	England	One of the first non-residential
2012/10	Innerleithen	Scotland	First brettstapel passive house
2012/11	Exeter	England	First affordable multi-residential passive house
2012/11	Herefordshire	England	Wahroonga
2012/11	Nordirland	Ireland	Omagh
2012/12	London	England	Stories Mews 2

Appendix 5: Table of Cognitive and Sociopolitical legitimacy on different levels of analysis.

TABLE 1
Entrepreneurial Strategies to Promote New Industry Development

Level of Analysis	Type of Legitimacy	
	Cognitive	Sociopolitical
Organizational	Develop knowledge base via symbolic language and behaviors	Develop trust in the new activity by maintaining internally consistent stories
Intraindustry	Develop knowledge base by encouraging convergence around a dominant design	Develop perceptions of reliability by mobilizing to take collective action
Interindustry	Develop knowledge base by promoting activity through third-party actors	Develop reputation of a new activity as a reality by negotiating and compromising with other industries
Institutional	Develop knowledge base by creating linkages with established educational curricula	Develop legitimacy by organizing collective marketing and lobbying efforts

Source: Aldrich, H. E. and Fiol, C. M., 1994. Fools Rush in? The Institutional Context of Industry Creation. *The Academy of Management Review*, 19(4): 649.

Appendix 6: Articles used in article review with publishing year/month:

Irish Independent 2006/02 WHY WE LOVE OUR GREEN HOUSE http://www.independent.ie/unsorted/features/why-we-love-our-green-house-26399626.html

The Guardian 2006/04 The impossible dream http://www.guardian.co.uk/commentisfree/2006/apr/26/replytojeremyleggett?INTCMP=SRCH

Irish Independent 2006/05 Temp Head http://www.independent.ie/unsorted/indofeedtemp/temp-head-26385824.html

Irish Independent 2006/11 Change your habits and shave hundreds of euro from ESB charges http://www.independent.ie/business/personal-finance/change-your-habits-and-shave-hundreds-of-euro-from-esb-charges-26356279.html

Irish Independent 2006/11 Ireland's hottest new ideas and cool inventions http://www.independent.ie/business/irish/irelands-hottest-new-ideas-and-cool-inventions-26418994.html

The Guardian 2007/03 Energetic debate on greener homes http://www.guardian.co.uk/environment/2007/mar/19/energy.business?INTCMP=SRCH

The Guardian 2007/04 Zero tolerance http://www.guardian.co.uk/society/2007/apr/11/communities.carbonemissions?INTCMP=SRCH

Irish Independent 2008/03 Behind closed doors: Connemara designer is building on Kyoto http://www.independent.ie/lifestyle/property-homes/behind-closed-doors-connemara-designer-is-building-on-kyoto-26430183.html

The Guardian 2008/03 Is this the greenest city in the world? http://www.guardian.co.uk/environment/2008/mar/23/freiburg.germany.greenest.city?INTCMP=SRCH

Irish Independent 2008/05 co carlow Eco development of 10 houses http://www.independent.ie/unsorted/property/co-carlow-eco-development-of-10-houses-26448249.html

The Guardian 2008/05 Passive resistance http://www.guardian.co.uk/lifeandstyle/2008/may/10/ethicalliving.greenbuilding?INTCMP=SRCH

Irish Independent 2008/06 Tax cut could slash annual home heating bill to €100 http://www.independent.ie/irish-news/tax-cut-could-slash-annual-home-heating-bill-to-100-26455712.html

Irish Independent 2008/07 Builders told all homes must be carbon neutral by 2013 http://www.independent.ie/irish-news/builders-told-all-homes-must-be-carbon-neutral-by-2013-26464047.html

Irish Independent 2008/09 Saving the planet with Passive resistance http://www.independent.ie/lifestyle/property-homes/saving-the-planet-with-passive-resistance-26474532.html

Irish Independent 2008/10 Eco Advice: How to build a zero carbon home http://www.independent.ie/lifestyle/property-homes/eco-advice-how-to-build-a-zero-carbon-home-26488718.html

The Guardian 2009/01 A roof over your head? So last year http://www.guardian.co.uk/artanddesign/2009/feb/01/sliding-house-architecture-drmm?INTCMP=SRCH

The Guardian / observer 2009/02 Revolving buildings: the new shape of things http://www.guardian.co.uk/artanddesign/2009/feb/22/architecture-dubai-revolving-buildings?INTCMP=SRCH

The Guardian 2009/05 Green technology through the ages http://www.guardian.co.uk/environment/gallery/2009/may/21/copenhagen-climate-change-manchester-report?INTCMP=SRCH

The Guardian 2009/05 Zero-carbon eco home is light years ahead http://www.guardian.co.uk/environment/2009/may/21/active-house-denmark-zero-carbon?INTCMP=SRCH

Irish Independent 2009/06 Going green? Don't get blinded by eco-bling http://www.independent.ie/business/personal-finance/latest-news/going-green-dont-get-blinded-by-ecobling-26546188.html

The Guardian 2009/08 Q&A: Zero-carbon homes http://www.guardian.co.uk/environment/2009/aug/04/zero-carbon-homes?INTCMP=SRCH

The Guardian 2009/09 What makes Europe greener than the US? http://www.guardian.co.uk/environment/2009/sep/29/europe-greener-us?INTCMP=SRCH

Irish Independent 2009/11 Wishful thinking in the house of Paddy http://www.independent.ie/entertainment/tv-radio/wishful-thinking-in-the-house-of-paddy-26577969.html

The Guardian 2009/12 How can I make my heating system more efficient? http://www.guardian.co.uk/environment/2009/dec/21/central-heating-system?INTCMP=SRCH

The Telegraph 2010/04 Green property: an energy efficient home in Cambridge http://www.telegraph.co.uk/property/greenproperty/7582252/Green-property-an-energy-efficient-home-in-Cambridge.html

The Telegraph 2011/01 Eco homes: The future is green http://www.telegraph.co.uk/property/greenproperty/8264042/Eco-homes-The-future-is-green.html

The Guardian 2011/01 Keeping sustainability at the top of the local government agenda http://www.guardian.co.uk/local-government-network/2011/jan/21/keeping-sustainability-local-government-agenda?INTCMP=SRCH

The Telegraph 2011/11 An eco-vicarage: St Mary's, Kingswinford http://www.telegraph.co.uk/property/greenproperty/8889046/An-eco-vicarage-St-Marys-Kingswinford.html

The Telegraph 2012/01 Building a home the green way http://www.telegraph.co.uk/earth/greenerliving/9032767/Building-a-home-the-green-way.html

The Guardian 2012/01 How green is their valley? Ebbw Vale residents sought to test eco homes http://www.guardian.co.uk/money/2012/jan/18/ebbw-vale-eco-homes-uwha?INTCMP=SRCH

The Telegraph 2012/05 Hay Festival 2012: Solar eclipses rivals http://www.telegraph.co.uk/culture/hay-festival/9300718/Hay-Festival-2012-Solar-eclipses-rivals.html

The Telegraph 2012/06 Eco living: the rise of the passivhaus http://www.telegraph.co.uk/property/greenproperty/9312157/Eco-living-the-rise-of-the-passivhaus.html

The Telegraph 2012/11 Eco living: How about a Passivhaus building? http://www.telegraph.co.uk/property/greenproperty/9678717/Eco-living-How-about-a-Passivhaus-building.html

The Guardian 2013/03 Sustainable houses are becoming the new ideal homes http://www.guardian.co.uk/environment/blog/2013/mar/06/sustainable-houses-ideal-homes?INTCMP=SRCH

Sources

Aldrich, H.E. & Fiol, C.M. (1994) 'Fools Rush in? The Institutional Context of Industry Creation'. The Academy of Management Review, 19 (4): 645-670.

Amburgy, T.L. & Rao, H. (1996) 'Organizational Ecology: Past, Present and Future Directions'. The Academy of Management Journal, 39 (5): 1265-1286.

Baum, J. A. C. & Shipilov, A. V. (2006) 'Ecological Approaches to Organizations'. In: Clegg, S. & Hardy, C., Nord W.R. & Lawrence, T. (eds.) The Sage handbook of organization studies. London: Sage Publications. pp.55-110.

BREEAM (2013) BREEAM Certified Projects. Available from: http://www.greenbooklive.com/search/buildingsearch.jsp?id=202&productName=&sectionid=0&partid=10023&countryId=56 [Accessed on 21 April 2013]

Cost Efficient Passive Houses as European Standards (n.d.) Available from: http://www.cepheus.de/eng/ [Accessed on 21 April 2013]

Delacroix, J., Swaminathan, A. & Solt, M.E. (1989) 'Density dependence versus population dynamics: An ecological study of failings in the California wine industry.' American Sociological Review, 54 (2):245–62.

DiMaggio, P.J. & Powell W.W. (1983) 'The Iron Cage Revisited: Institutional Isomrophism and Collective Rationality in Organizational Fields.' American Sociological Review, 48 (2):147-160.

Graduate School of the Environment (n.d.) Available from: http://gse.cat.org.uk/downloads/passive_house.pdf [Accessed on 21 April 2013]

Hannan, M.T. & Carroll, G.,R. (1995) 'Theory Building and Cheap Talk About Legitimation: Reply to Baum and Powell.' American Sociological Review, 60 (4):539-544

Hannan, M.T. & Freeman, J. (1977) 'The Population Ecology of Organizations.' American Journal of Sociology. 82 (5):929-964

Lange, D., Boivie, S. & Henderson, A.D. (2009) 'The Parenting Paradox: How Multibusiness Diversifiers Endorse Disruptive Technologies While their Corporate Children Struggle.' The Academy of the Management Journal, 52 (1):179–198.

Meyer, J.W. & Rowan, B. (1977) 'Institutionalized Organizations: Formal Structure as Myth and Ceremony.' American Journal of Sociology. 83 (2): 340-363

Salimath, M.J. (2011) 'Population ecology theory: implications for sustainability.' Management Decisions, 49 (6):874-910.

Singh, J.V. (1993) 'Review essay: Density dependence theory—Current issues, future promise.' American Journal of Sociology, 99 (2):464–73.

Shepherd, D.A. & Zackarakis, A. (2003) 'A new Venure's Cognitive Legitimacy: An Assessment by Customers.' Journal of small business management, 41 (2):148-167

Passive House Institute (2012a) Passive House Institute / About us. Available from: http://passiv.de/en/01_passivehouseinstitute/01_passivehouseinstitute.htm [Accessed on 21 April 2013]

Passive House Institute (2012b) PHPP – the energy balance and Passive House planning tool. Available from:http://passiv.de/en/04_phpp/04_phpp.htm [Accessed on 21 April 2013]

Passive House Institute (2012c) PHI Literature. Available from: http://www.passiv.de/en/05_service/05_literature_en.htm [Accessed on 21 April 2013]

Passive House Institute (2012d) Certification. Available from: http://www.passiv.de/en/03_certification/03_certification.htm [Accessed on 21 April 2013]

Passive House Institute (2012e) Passive House Institute accredited Building Certifiers. Available from:http://passiv.de/en/03_certification/02_certification_buildings/03_certifiers/01_accredited/01_accredited.php [Accessed on 21 April 2013]

Passive House Institute (2012f) Passive House Requirements. Available from: http://passiv.de/en/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm [Accessed on 21 April 2013]

Passive House Institute (2012g) EnerPHit - certified retrofits with Passive House components. Available from: http://www.passiv.de/en/03_certification/02_certification_buildings/04_enerphit/04_enerphit.htm [Accessed on 21 April 2013]

International Passive House Association (2010) Active for more comfort: The Passive House. Available from: http://www.passivehouse-international.org/index.php?page_id=70 [Accessed on 21 April 2013]

Peterson, T. & Koput, K. (1991), 'Density dependence in organizational mortality: legitimacy or unobserved heterogeneity?' American Sociological Review, 56 (3):399-409.

UK Government, 2013. Improving the energy efficiency of buildings and using planning to protect the environment, https://www.gov.uk/government/policies/improving-the-energy-efficiency-of-buildings-and-using-planning-to-protect-the-environment/supporting-pages/code-for-sustainable-homes

Van Witteloostuijn, A. (2000) 'Organizational ecology has a bright future' Organization Studies, 21 (2):V-XV.

Zucker, L.G. (1989) 'Combining Institutional theory and population ecology: No Legitimacy, no history.' American Sociological Review, 54 (4):542-545.

Evolution and Dynamics of 3D TV Industry

Joona Forss, Jaakko Hyytiäinen, Yiyun Shen and Antti Turpeinen

ABSTRACT

This research focuses on the development of the three dimensional television (3D TV) industry in the US and European markets between 2006 and 2012. As the 3D technology is one of the most recent technological advancements in television industry and there is few prior researches done about this industry, there is motivation to gain further understanding of the structure and development of the 3D TV industry in general. The aim of this research is to determine the stage of the 3D TV industry life-cycle and to gain insight of the industry structure as well as the dynamics of the industry. The industry life cycle theory (ILC) is used for explaining the development of the industry. The main findings of our research are that the firm population is growing, there is no single dominant design and there is a strong linkage between pre-entry experience from television manufacturing and entry to 3D TV industry. Moreover, the size of a firm does not give technological advantage over its competitors.

Keywords: three dimensional television, 3D TV, television industry, Industry life cycle, industry evolution.

1. Introduction

In this study we research the development of three dimensional television (3D TV) industry in consumer markets from 2006 to 2012. Television industry in general has gone through multiple significant technological changes throughout its history, which have all redefined the industry during their time. These changes include technological advances such as color television, flat-panel displays (FPD) and high-definition television. In addition to these technological advancements, the 3D TV can be seen as the most recent major development in the industry. This research aims to define the evolution of the latest technological development in television industry.

3D TV in consumer markets is extremely young industry, even though the technology for 3D imaging has been around for nearly two centuries. The technology to provide 3D images for viewers has been around since 1838 when stereoscope was invented by Sir Charles Wheatstone (Bowers, 2001) and the first 3D movie was shown for public in 1922. Still it took until 2006 to provide affordable 3D TV sets for consumer markets. The first 3D TV set for consumers was introduced by Philips in 2006, in 2008 major TV manufacturers launched their first products to consumer markets and in 2010 the 3D TV sets fulfilling the current standards were announced for the first time. In 2010, the technology for 3D TV sets was updated together with the broadcasting standardization, thus, in many sources the first 3D TV has been said to be launched in 2010(DVB, 2010). (Anon., 2011)

This report consists of 6 sections. In the first part, the basic characteristics of the industry, the objectives of the research as well as the research hypotheses will be described. The second section describes the industry life-cycle (ILC) theory, which is the theoretical framework on which the research is based on. The third section focuses on describing the collected data as well as the methods used for answering the research questions. The fourth section states the results of the research and answers the research questions. The fifth section discusses the results and their relevancy and states down our conclusions based on the analysis. The sixth section discusses the limitations of the research and points out possible future researches to improve the validity of the results.

1.1 Industry Definition

In short, a 3D TV is a television which is capable of transforming a two-dimensional image into a three-dimensional image perceived by the viewer. The transformation can be done with two fundamentally different methods; with or without the aid of 3D glasses. Without glasses technology separates the image optically in the display panel into two separate rays of light; one for each eye. These separate rays of light will be pro-

cessed in brains into two images, which are then combined into one 3D image. With glasses technologies the transformation is done with the modification of the pixels and the glasses used. In active glasses, the television set is communicating with glasses, thus determining which images will be shown to which eye, thus the small differences in the pictures are combined into a 3D image by the viewer. On the other hand, in passive glasses based 3D TV sets the predefined sets of the pixels are visible for only one eye, hence continuously providing individual images for each eye. These separate images are processed in viewer's brains and combined into a single 3D image. (Anon., 2011)

Other than the transformation of the 2D images into 3D images, the 3D TVs has the same basic operating principles with the regular TV sets and it can be used as a regular TV. The technological solutions, such as the display panels, pixels and how the television broadcast signals are processed, are basically the same in regular FPD TVs and 3D TVs. Thus, as the dimensional transformation is only one part of the 3D TV, the 3D TV industry is not an industry per se, but rather a sub-industry within the general television industry. Hence, in this report we will use the 3D TV industry to refer to this sub-industry of general television industry.

1.2 Research Scope

The scope of our research is on the 3D TV set manufactures. As the 3D technology has been around for centuries, the development in related industries such as 3D content production, movie theaters, 3D content processing and 3D displays were excluded from this research. Thus, the timeframe of the research was set to start from the first announced launch of a 3D TV.

For patents, the geographical scope was focused on US and the timeframe was extended to begin from 1986, when the first 3D TV specific patent was issued in US, to include the relevant innovations made by the TV set manufacturers. The limitation of scope to 3D TV set manufacturers was done in order to ensure a clear focus of the research and to keep the research within the limits of the estimated workload for the course. Moreover, the focused geographical areas were decided to include the 3D TV sets sold in US markets and/or in European markets, which are in economical perspective the two largest markets for consumer electronics. By researching the development of 3D TV industry in the main markets we assume the results to give accurate information of the industry in general.

Due to the young age of the industry, there are no other researches available on the topic. Moreover, due to the close relation to regular TV industry, the success of the companies cannot be measured by their sales figures, as none of the manufacturers are providing specific sales figures. Thus, this research focuses on defining the fundamental characteristics of the industry by the firm population, technological development and the incentive created by pre-entry experience in television manufacturing.

1.3 Research Questions and Hypotheses

The objectives of our research are 1) to identify the life-cycle stage of the 3D

TV industry and 2) to understand the industry dynamics. To meet the objectives, we will answer the following research questions:

1. The evolution of 3D TV industry, past and present
   a. How has the number of 3D TV manufacturers evolved until 2012?
   b. How has the 3D TV technology (i.e. display technology) evolved until 2012?
2. Is pre-entry experience necessary for entering the industry?
3. Are larger firms technological leaders in the industry?

In relation to the research questions, we state the following four hypotheses:

H1. The number of firms is still increasing in 2013

H2. There is no dominant design in 3D TV industry

H3. Pre-entry experience in television industry creates incentive for entry

H4. Larger firms are technological leaders

2. Theoretical Framework

In this section we are going to discuss the theory on which we will base our research. There were two possible frameworks to choose from for studying industry evolution and its characteristics and dynamics. We chose industry life-cycle (ILC) theory as our framework of this study. The other option would have been organizational ecology, but since 3D TV industry is a technology centered industry and the empirical contexts of ILC theory are technology-based industries and product-defined industries ILC theory is more suited for our research and our points of view. Organizational ecology on the other hand focuses on firm populations and their effect on organizations.

Industry life-cycle theory states that the firm numbers in an industry follows an inverted U-curve path as a function of time (Peltoniemi, 2011). According to the theory all industries follow the pattern and go through the stages of the life-cycle. ILC theory states that industry emergence is the consequence from a technological innovation (Klepper, 1996). First there is the emerging phase when the industry emerges and the firm numbers is still low. Entries and exits are positively correlated and the net increase is still small (Geroski, 1995). When the industry gains more legitimacy the number of firms starts to grow more. There are still exits but now entries are even more abundant and because of the larger net increase the firm numbers starts to grow exponentially. The competition in the industry also increases as the firm numbers grow. Young industries tend to represent "replacing forest" type of dynamics where entrants replace existing firms instead of "revolving door" dynamics where industry consists of incumbents and small innovators enter and exit (Sarkar *et al.,* 2006). 3D TV industry is a young industry and based on the premise laid down by ILC theory we will assume that it will have the structure of a young industry. Therefore we expect to find that the firm numbers will form the left half of the inverted U-curve as a

function of time and that the industry's firm number is still at the exponential growth phase.

In the early phase of the industry the R&D efforts are directed to product development (Utterback and Abernathy, 1975). Therefore the innovations that take place are more of radical innovations. The firms that enter the industry are creating competence-destroying innovations that create the new industries being born (Tushman and Anderson, 1986). The technological uncertainty is high and there are no industry standards. These factors cause the product diversity to be high also. Young industries are also building their legitimacy. Although, in 3D TV industry we will assume that the innovations will be more of the incremental type because the basic architecture is already a standard. One might consider the change in the core technology to be a radical innovation, but in this research we will not focus on the types of the innovations. We consider the innovations to be competence-enhancing innovations because of the role of 3D TV industry as a sub-industry of television industry. Still we will expect that the product diversity will be somewhat high and that there will be no industry standards because of the nature of the young industry.

As industries reach maturity the firm numbers start to go down rapidly. The shakeout occurs because of size advantage in R&D (Klepper, 1996). Entries are rare and exits occur frequently. After the shakeout firm numbers will stagnate to lower level and remain somewhat stable. R&D focus shifts to process and the product variety decreases (Klepper, 1996). Innovation types move from radical innovation to incremental innovation. Because of the size advantage causing the shakeout, the average size of firms grows. Mature industries also have built their legitimacy. Usually the shift to maturity also means the emergence of a dominant design. We will discuss the concept of dominant design in more detail in the next paragraph. Since 3D TV – industry is assumed to be at its early phase we will not expect to find any characteristics of a mature industry.

Dominant design is a concept closely related to the ILC theory. The concept itself is not easily studied and there aren't many researches on it. Nevertheless it is a popular and widely accepted concept that has been used in many studies on industry evolution and it has been included in many versions of the theory, for example Utterback and Abernathy (1975) and Tushman and Anderson (1986) include the concept in their models of industry life-cycle. In the literature on technological innovation and technology-based industries dominant design has also been a popular concept. Schilling (2010) uses it to describe the dynamics of an industry and even explain the phase of an industry. She describes the early phase of an industry when there is no dominant design as preparadigmatic phase and the era after the emergence as paradigmatic phase. She bases her definition of dominant design on one design being more successful and becoming an industry standard and also on the decrease of technological uncertainty.

Even though the architecture of a television is a standard we expect that there will be no dominant design in 3D TV industry. Furthermore, we will focus on the technological factors that differentiate 3D TV from other television

types, i.e. 2D TVs. Based on ILC theory and the age of the industry, we expect that there will be no dominant design in terms of the display technology of the 3D image. We will make a rough categorization in the main technology types of producing the 3D image. The technological uncertainty is fairly high on the display technology so we will assume that there will be products of all kinds in the market. It is uncertain that which technology will become the best.

Firm success in ILC theory is usually measured with survival (Peltoniemi, 2011). In this study we will not focus on success or the survival of the firms because of young nature of the industry. We expect there to be few exits so it's not feasible to measure the success of the firms. Success factors described in ILC theory are entry timing, pre-entry experience and innovativeness. Early entry has been found to affect the survival rate of the firms positively (Klepper and Simons, 2005). This is because of pre-emption of assets and cumulative learning but technological uncertainty and potential financial burnout have a negative effect on the benefits of early entry. Also, technological leadership is also one advantage of early entry (Schilling, 2010). Pre-entry experience means that a firm has experience from a relating industry prior to entering the market or they are spin-off firms. These firms are called *de alio* entrants and entrepreneurial firms are called *de novo* entrants. *De alio* firms have been found to be more successful that *de novo* firms (Klepper, 2002). Innovativeness has also been found to have a positive effect on success, i.e. survival (Agarwal, 1996). We expect to find that firms in 3D TV industry will have pre-entry experience. Since we will not focus and can't draw conclusions on success of the firms we will focus on pre-entry experience as an entry criterion.

Mature industries can give birth to new industries (Peltoniemi, 2011). Inter-industry relationships have been studied in the context of the ILC theory, but only a little. Mainly the concept describes how mature industries give birth to emerging industries or how the mature industries feed emerging industries with competence, employees and spin-offs. Also vertical exchange relationships have been studied. This concept is important in terms of 3D TV industry because the industry is expected to be mostly consisting of firms from television industry. There are high inter-industry effects from television industry. The inter-industry relationship with television industry is also studied by studying pre-entry experience.

Firm sizes are expected to be large because of high interconnectedness. We base our assumption on the basis that 3D TV industry is highly interconnected and that it can also be considered a sub-industry within the whole television industry and to the assumption that all entrants are *de alio* entrants. Since innovativeness is considered as one success factor of a firm, we can consider firm size as one proxy of its success, though not in 3D TV industry itself but in general, and study the relation of innovation activities to firm size. We also take the concept of technological leadership to study and state that firms with most innovation activities are technological leaders. Therefore the largest firms are expected to be technological leaders. Patents have been found as a reliable proxy for innovation activities (Gort and Klepper, 1982). We also assume that larger firms will have

more resources to engage in exploratory activities and therefore have higher innovation rate. Even though it has been found out that innovation activity doesn't grow proportionally to firm size (Cohen and Klepper, 1996) and that R&D intensity does not grow with size (Cohen, Levin and Mowery, 1987) we can assume that the absolute number of innovation activities will grow in terms of firm size.

In this research we focus on the structure of the industry, dominant design, pre-entry experience as an entry criterion, and technological innovation in relation to firm size. As mentioned before we expect to find evidence that 3D TV industry is at its early phase and that the firm numbers is still growing. We also expect to find product diversity and we assume that there is no dominant design in the industry, which would also indicate a young industry. Pre-entry experience is expected to be an entry criterion because of its nature as a success factor and we expect to find that most, if not all, of the firms will have pre-entry experience in television industry. Furthermore because of the interconnectedness of 3D TV industry and innovativeness being a success factor we will expect to find that larger firms have more innovation activities than smaller ones.

3. Data and Methods

This research analyses the development and current state of 3D TV industry. To understand current state and development, we have employed industry evolution theories as a basis of our research and collected data of key variables presented in industry life cycle theory, such as entries, exits, technology, size, and patents. Our scope for this research is firms that sell 3D TVs for consumers and operate in either US or EU market. With this scope we were able to acquire reasonable amount of data to prove our hypotheses. Moreover, narrowing the scope to contain only the EU and US market, we were able to obtain all required data from each firm.

In this research we had to use multiple sources to collect all the firms that are selling or have been selling 3D TVs for consumers. First, we started by searching all the firms that are currently selling 3D TV for consumers in US and EU. In order to get as wide range as possible we went through websites, such as pricegrabber.com, shopper.cnet.com and pricerunner.co.uk, which compare prices from different retailers. Moreover, we scanned through some Asian price comparison websites in case these firms would have entered into EU or US market. Second, we searched for possible exits or niches that have not come up in our previous search and sought for more confirmation to our data. In this phase we applied patent data from United States Patent and Trademark Office website and news data from industry's most important news media 3D Focus. With this process we were able to find 23 different entries to the 3D TV industry.

In order to analyze industry structure by its members, it is essential to search for entry dates. To define entry date for each firm, we decided to use the most reliable source that we are able to find, even though, applying only one source, which is less reliable, could provide us more congruent results. We ranked these sources from 1 to 4:

1. Website of the firm. Some public firms posted a press release, when entering into 3D TV market.
2. News media that are specialized in 3D technology. The most popular industry media posted articles of some entries into industry.
3. Random media. We used Google's search engine to discover information from other media.
4. Google Trends. Google Trends shows how many times particular keyword has been searched during specific time period. With Google Trends we were able to gather searching data from each firm on the specific time period. Using keywords "firm name" and "3D TV" together, were able to find the date when people started searching for firm's 3D TV products.

Although, Google Trends was ranked as our least reliable source, it was applied to ensure the reliability of information. We were able to pinpoint approximately the entry date just by inspecting Google's search results.

The second hypothesis required information on different technologies that are used in this industry. Technologies in 3D TV industry are divided into three different categories: passive filters, active shutters and glass-free technology. Glasses-free technology is still under development and there are some unsolved problems that prevent manufacturers from producing competitive glasses-free products. Passive glasses shows different picture to your left eye than your right eye. Active shutter glasses block off each eye in turn, which allows viewer to see three dimensional images. Using passive or active glasses is a matter of taste. However, some television manufacturers favor passive glasses because they are less expensive. Technology that each firm uses can be found under their product information. However, we had to use public media in order to find if firms have changed their technology at some point. (CNET Asia, 2013)

For pre-entry experience this study searched for any previous experience in television industry. We browsed through firm's previous product catalogues and public media in case that firm had been producing typical televisions before producing televisions with 3D features.

For technological activity we seek for firms that are driving technological development in this industry. Therefore, firm's activity to develop novel patents that are approved by United States Patent and Trademark Office is rational measurement for technological activity. US patent office had 388 registered patents for 3D technology. This technology has been around for such a long time, therefore, we chose to seek for patent data starting from the 80s. However, only 70 out of 388 patents were related to 3D TV technology and only 18 of these patents were published by manufacturers of 3D TV. The revenue data was collected from firms' annual reports with currency converted using exchange rate retrieved from ECB database in corresponding time period. Since 3D TV segment is not listed separately in manufacturers' financial data, we use the total sales revenue data for comparison.

Results of data collection are presented and discussed in next sections. Collected data and the sources are summed up in Table 1.

Table 1: Data sources

Data	Data source
Firm numbers	Price comparison websites, public media and United States Patent and Trademark Office
Entry & exit dates	Annual reports, press releases, public media, Google Trends
Size of firms	Annual reports
Technology	Product information and reviews and public media,
Pre-entry experience	Product catalogue, Public media
Technological activity	United States Patent and Trademark Office

4. Results

The results are presented in appendices to test our hypotheses relating to 3D TV industry structure and the industry dynamics. The 3D TV industry emerged in the new century when Philips launched its first 3D TV in 2006 and took off in early 2010 when the waves of film Avatar make 3D spread all over the world.

4.1 Industry Structure

H1. The number of firms is still increasing in 2013

Appendix II shows the list of 23 firms in 3D TV industry between 2006 and 2012, and 3D TV manufacturers' entries, exits and firm numbers are shown in Appendix I, which provides an overview of the 3D TV industry structure.

4.1.1 Number of 3D TV Manufacturers

The density of manufacturers in 3D TV industry follows the exponential trend line during the period 2006-2012. In Appendix I, it can be seen that the in the early phase of the industry firm numbers grow steadily but remains low. The net increase remains low as suggested by ILC theory. In the first quarter of 2010 we can see a sharp increase in total number of 3D TV manufacturers (i.e., from four manufacturers to eight) with the density increasing by 100%. The increase is seen to continue sharply. We find support for our first hypothesis. Between 2006 and 2009 the number of manufacturers increased steadily year by year, except in 2009. The industry density sharply increases from four (4) manufacturers in Q4/2009 to twenty-two (22) in Q3/2012.

4.1.2 Entries and Exits in 3D TV Industry

Appendix I shows quarterly entries and exits in the 3D TV industry. There were six entries between Q2/2006 and Q3/2008, among which all are Asian (i.e., Japanese and South Korean) firms, except Philips from Europe. Two exits (i.e., Philips and Hyundai IT) were seen between Q3/2008 and Q4/2009. However, the exits were tem-

porary as these firms re-entered 3D TV industry in 2010.

We can see a rapid growth in the industry in terms of new entries counts up to nine firms and seven firms in 2010 and 2011 respectively. Rest of the incumbents in the traditional TV industry, such as Toshiba and Sony, entered in 2010. In 2011, 3D TV industry saw small manufacturers entering the market, such as Loewe, Cello, Sceptre and Manta. The net increase in firm numbers grows rapidly, entries become abundant but exits remain low and the industry shifts to exponential growth phase like ILC theory suggested.

In the whole observation period 2006-2012, there is only one real exit, i.e., Dixons exited in Q2/2012. Dixons Retail was a UK based electronic devices retailer and the Dixons-branded 3D TV's manufacture was outsourced to Asia. It is clear that as 3D TV was not Dixons' main business and the firm experienced financial difficulties in the economic downturn, Dixons was not able to continue investing into 3D TV business and had to exit.

4.2 Dominant Design

H2. There is no dominant design in 3D TV industry

We find support for our second hypothesis. There is no clear winner in terms of dominant design during the observation period. To study the existence of dominant design in 3D TV industry, we divide 3D TV technologies into three categories: passive 3D TV, active 3D TV and glasses-free 3D TV. Appendix III shows the cumulative number of firms that offer various types of 3D TV technologies. In 2012, there were 13 manufacturers producing active 3D TVs whereas 16 manufacturers producing passive ones. Only one firm (i.e. Toshiba) manufactures glasses-free TV in 2012, and Philips made glasses-free models between 2006 and 2009 but discontinued afterwards. The offering of different technologies remains diverse during the whole observation period and no technology gain a dominant share of the market. In 2010 it seemed that active technology would have taken a step to becoming a dominant design but in 2011 there is a sharp increase in passive technology offering. Currently there are 16 manufacturers who offer passive technology, 13 manufacturers who offer active technology and one manufacturer who offers glasses-free technology based 3D TV sets.

4.3 Pre-entry Experience

H3. Pre-entry experience in television industry creates incentive for entry

We find strong support for the role of pre-entry experience in 3D TV manufacturer's entry in the industry. Out of the 22 firms studied, a majority has pre-entry experience in TV industry, such as TV production or TV retail. Polaroid is the only one firm which has no pre-entry experience but remain in the industry. However, to some extent, Polaroid is also related to 3D industry in general as it is a global firm specialized in manufacturing cameras and has experience in photography and 3D imaging and they also manufacture regular TV sets currently. The other 22 firms had experience from television industry prior to entering 3D TV industry.

4.4 Technological Leadership

H4. Larger firms are technological leaders

We cannot find support for hypothesis 4. The correlation between number of patents and firm size is not found in 3D TV industry. We studied all the 388 patents registered in the United States Patent and Trademark Office using search keywords "three dimensional" and "television", and found 70 patents which are relevant to 3D TV technologies. The cross-check between the list of 3D TV technology related patents and the list of 3D TV manufacturers, we got 18 patents filed by 3D TV manufacturers from 1986 onwards. Appendix IV illustrates the number of patents and citations and revenue of firms. Since not all of the manufacturers are public, we excluded those small private firms whose revenue data is not available. Although, there were no patents for the firm we had no revenue data. There were only a few patents found overall relating to 3D TV industry and the division of innovation activities was very sporadic among the firms. The absolute number of patents doesn't grow as the firm size grows.

5. Discussion and Conclusions

The 3D TV industry follows the propositions and premises of ILC theory well. We managed to analyze the structure and dynamics of the young industry. We determined the evolutionary development as well as the dynamics in terms of technology, pre-entry experience and technological leadership.

We found a reliable answer to our first research question. As for the research question 1a, we found out the evolutionary path of the 3D TV industry. We can clearly see the development of firm numbers in the time frame of 2006-2012 in the Appendix I. The growth trajectory follows the ILC theory well and we can see that the industry is at it early phase and in exponential growth phase. The history of the industry also matches the description of ILC theory. This industry take-off was powered partly by the standardization of 3D TV broadcasting as well by the 3D movie Avatar hitting $2.78 billion worldwide (Anon. 2009) in 2009-2010. Due to the successful movie, consumers' interests in 3D brought a new round worldwide "booming" of 3D image industry and introduced a new trend to TV industry, i.e., 3D TV industry.

One finding is also that larger firms all entered in 2010 and those entries were followed by the entries of smaller manufacturers, e.g. Loewe, Cello and Sceptre. The market is expected to grow and since most of the larger television manufacturers have already entered the market we can conclude that the industry will attract smaller firms in the future. The history of the industry is also longer than expected. Mostly 3D TV industry is considered to emerge in 2010, but there were already products offered in 2006. Interestingly there are also some exits already in 2008 and 2009 even though we expected there to be only few exits and that the industry's history to begin around 2010.

For our research question 1b, we found that the technology for 3D TVs has evolved steadily with no dominant design to be identified in the industry.

We find also that the offering of passive and active technologies has grown simultaneously. Glasses-free technology hasn't kicked off and its offering has remained low. This is probably due to technological uncertainty relating to it. It would seem that passive technology could take the position of a dominant design but with our finding s it's too early to say.

As we expected, we found that most of the firms in 3D TV industry are *de alio* entrants from television industry. For our second research question we find that pre-entry experience in television industry can be considered to create incentive for entering the industry, at least for early entries. We conclude that this will most likely result from the fact that 3D TV industry is a sub-industry of the television industry and that they are closely inter-related. As being one of the success factors described in ILC theory, pre-entry experience might be a crucial factor in the success in 3D TV industry. Although, we also found that Polaroid has entered without any experience so we can't say that it is absolutely necessary to have pre-entry experience. Also, Polaroid entered the regular TV industry in addition to 3D TV industry at the same time. Taking this into account, all the firms in 3D TV industry are also present in the regular TV industry. Even though pre-entry experience is not an absolute requirement, there is still a very strong inter-dependence between the two industries.

We find answer to our third research question to be that larger firms are not necessarily technological leaders. In fact, we find that there are no technological leaders in the industry. The patents were distributed quite equally among the firms with most of the firms not having any patents at all. Only Sony had more than three patents. The results might be affected by the small absolute number of patents. There is a lot of technological uncertainty and the technologies probably are not easy to protect. The core technology has been developed so long ago that patenting them is not possible anymore. There would have to be some major development or radical innovation in order to increase the patenting activities. Firms could also wait to see which technology option will rise as the dominant design before developing it further.

Our study has direct managerial implications. First, we find that the number of firms in 3D TV industry is expected to grow in 2013, which indicates the increasing competition between firms in the industry. The ILC theory suggests that failure results from inability to ramp up production in order to gain cost-spreading benefits. For this reason, firms operating in 3D TV industry need to secure their supply sources and increase technological innovativeness in order to expand offerings to capture more market share and enter niche markets. Second, innovation activities and broad offerings can mitigate the risks brought by technology uncertainty. Once the industry dominant design emerges, firms' in-house knowledge in various technologies can bring competitive advantage, such as timing from research to production. Third, technological innovations and pre-entry experience in TV manufacturing and 3D imaging can give incentives to new entries in the industry, which suggests strategic directions for managers to perform competitor analysis and understand the industry landscape. Moreover, firms that are planning to enter the market should

consider the importance of pre-entry experience and the interconnectedness of the two industries. Finally, although we cannot find the relationship between firm size and technological leadership, investments in technological innovations require sufficient resources. Thus, firms should keep growing in size to obtain enough resources to support future innovation activities. Currently the importance of size on innovation activities should be taken into account so that a firm doesn't have to be large to innovate and that innovation is not necessary for being in the market.

The purpose of this study was to research the evolution and dynamics of the 3D TV industry. We focused on the structure, dominant design, pre-entry experience and technological leadership in the industry. To conclude, we found out that 3D TV industry follows the trajectory of ILC theory and that the industry is at the exponential growth rate. There was no dominant design to be identified and the product diversity between technologies was stable. Pre-entry experience was found to be a criterion for entering the market but there was not enough evidence to absolutely conclude it as a requirement. We found no correlation between firm size and innovation activities. There were no technological leader to be found and overall the patenting frequency was really low. The findings of this research follow the propositions and implications of ILC theory well and besides the findings for hypothesis 4 are what we expected to find.

6. Limitations and Future Research

Collected data provide significant prove for our hypotheses, however, there are some limitation concerning our method. Unfortunately, we were not able to use a single consistent data source for determining entry dates. Therefore, the data for entry dates could feature some variation; however, it should not have an effect on the results.

3D TV industry can be described as a sub-industry for television industry, which limits availability of some significant data, such as sales data, entry date, firm size, and market itself. Therefore, our industry research will not cover survival and success factor of its members. Moreover, Industry's age sets some limitations as well. Even though 3D technology has been around for a long time, the consumer sales part of this industry is quite young. First 3D TVs were produced in 2006 and industry started growing in 2010, which means that we clearly do not have enough data to produce confident support for requirement of pre-entry experience.

For further research we propose three topics, which would improve the understanding of the industry in general. First, we propose a research on the sales volume and market shares of the manufacturers. As industry matures, it could be possible to overcome some of the limitation that was mentioned earlier. For example, finding reliable data of sales volume and using it to define success factors in 3D TV industry. Moreover, when 3D TV industry reaches its maturity stage, a research on firm survival and more comprehensive

research about pre-entry experience could be noteworthy as well.

Second, we propose a comparative research between 3D TV industry and the general television industry to differentiate the distinctions in development. This would provide a more detailed definition of the 3D TV industry and a separation from the television industry because currently 3D TV industry can be seen as a sub-industry of television industry.

Finally, we propose a research on the innovation process and the role of academic institutes in the industry. As the patent data points out, only minority of the patents is issued for the manufacturing companies. Thus, the role of the R&D would be an interesting topic to conduct a research on.

References

3D Industry news. 2013. 3D Focus Ltd official website. Data Retrieved on 30th March 2013. Available at: http://www.3dfocus.co.uk/.

Agarwal, R. 1996. Technological activity and survival of firms. *Economics Letters,* vol. 52, pp. 101-108.

Anonymous, 2011. Development status of 3D TV industry and brief market analysis in 2011. Data Retreived on 4th April 2013. Available at: http://en.push3d.com/news/hynews/2011-02-17/236.html.

Asus official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.asus.com/.

Avatar Box Office Record. 2009. Box Office Mojo. Data Retrieved on 5th April 2013. Available at: http://boxofficemojo.com/movies/?id=avatar.htm.

Bowers, B. 2001. Sir Charles Wheatstone FRS 1802–1875. *IEE History of Technology Series,* vol. 29. p. 21.

Cello official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.celloelectronics.com/.

CNET Asia website. 2013. CBS interactive. Data Retrieved on 5th April 2013. Available at: http://asia.cnet.com/active-vs-passive-vs-glasses-free-3d-tvs-62219631.htm.

Cohen, W.M. and Klepper, S. 1996. Firm Size and the Nature of Innovation within Industries: The Case of Process and Product R&D. *The Review of Economics and Statistics,* vol 78, pp. 232-243.

Cohen, W.M., Levin, R.C. and Mowery, D.C. 1987. Firm Size and R&D Intensity: A Re-Examination. *Journal of Industrial Economics,* vol. 35, pp. 543-565.

Digital Industry news. 2013. National Magazine Company Ltd. Data Retrieved on 30th March 2013. Available at: http://www.digitalspy.co.uk.

Digital Industry news. 2013. Ziff Davis, Inc. Data Retrieved on 30th March 2013. Available at: http://www.pcmag.com/.

Digital Video Broadcasting DVB. 2010. Commercial Requirements for 3D-TV. *DVB BlueBook A151.* Data Retrieved on 30th March 2013. Available at: *http://www.dvb.org/technology/standards/a151_CR_for_DVB-3DTV.pdf*

Geroski, P.A. 1995. What do we know about entry? *International Journal of Industrial Organization,* vol. 13, pp. 507-540.

Google Trends. 2013. Google Inc official website. Data Retrieved on 30th March 2013. Available at: http://www.google.com/trends/.

Gort, M. and Klepper, S. 1982. Time paths in the diffusion of the product innovations. *Economic Journal,* vol. 92, pp. 630–653.

Hitachi official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.hitachi.com/.

Hyundai IT official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.hyundaiit.com/.

Klepper, S. 1996. Entry, exit, growth, and innovation over the product life cycle. *American Economic Review,* vol. 86, pp. 562-583.

Klepper, S. 2002. Firm survival and the evolution of oligopoly. *Rand Journal of Economics,* vol. 33, pp. 37-61.

Klepper, S. and Simons, K.L. 2005. Industry shakeouts and technological change. *International Journal of Industrial Organization,* vol. 23, pp. 23-43.

Loewe official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.loewe.com/.

Manta official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.mantamedia.tv/.

Mitsubishi electric official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.mitsubishielectric.com/.

Panasonic official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.panasonic.com/.

Peltoniemi, M. 2011. Reviewing Industry Life-cycle Theory: Avenues for Future Research. *International Journal of Management Review,* vol. 13, pp. 349-375.

Philips official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.philips.com/.

Price comparison website ASIA 1 2013. Alibaba.com Hong Kong Limited official website. Data Retrieved on 22th March 2013. Available at: http://www.alibaba.com/.

Price comparison website EU 1 2013. PriceRunner Ltd official website. Data Retrieved on 22th March 2013. Available at: http://www.pricerunner.co.uk/.

Price comparison website US 1 2013. PriceGrabber.com Inc. official website. Data Retrieved on 22th March 2013. Available at: http://www.pricegrabber.com/.

Price comparison website US 2 2013. CBS interactive Inc shopper website. Data Retrieved on 22th March 2013. Available at: http://shopper.cnet.com/.

Samsung official website. 2013. Data Retrieved on 30th March 2013.Available at: http://www.samsung.com/.

Sanyo official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.sanyo.com/.

Sarkar, M.B., Echambadi, R., Agarwal, R. and Sen, B. 2006. The effect of the innovative environment on exit of entrepreneurial firms. *Strategic Management Journal,* vol. 27, pp. 519-539.

Sceptre official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.sceptre.com/.

Schilling, M. 2010. *Strategic management of technological innovation,* 3rd Ed, McGraw-Hill/Irwin, New York, ISBN 978-0-07-338156-5.

Sharp official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.sharp.com/.

Sony official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.sony.com/.

Tech reviews. 2013. Teddington Studios. Data Retrieved on 30th March 2013. Available at: http://www.whathifi.com/.

Technicolor official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.thomsonconsumer.com/.

Technology news. 2013. Yahoo, Inc. Data Retrieved on 30th March 2013. Available at: http://voices.yahoo.com/technology/.

Toshiba official website. 2013. Data Retrieved on 30th March 2013. Available at: https://www.toshiba.co.jp/.

Tushman, M.L. and Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly,* vol. 31, pp. 439-465.

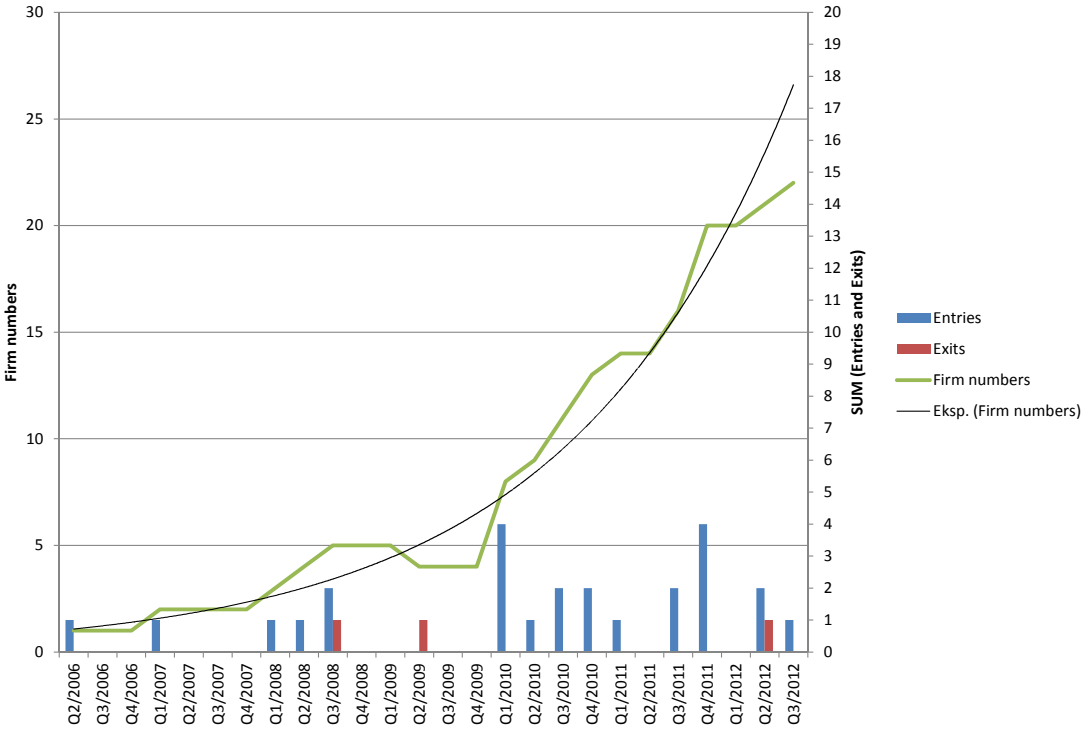
United States Patent and Trademark Office 2013. Patent Full-text Databases website. Data retrieved on 22th March 2013. Available at: http://www.uspto.gov/.

Utterback, J. and Abernathy, W. 1975. A dynamic model of product and process innovation. *Omega,* vol. 3, pp. 639-656.

VIZIO official website. 2013. Data Retrieved on 30th March 2013. Available at: http://www.vizio.com/.

Appendices

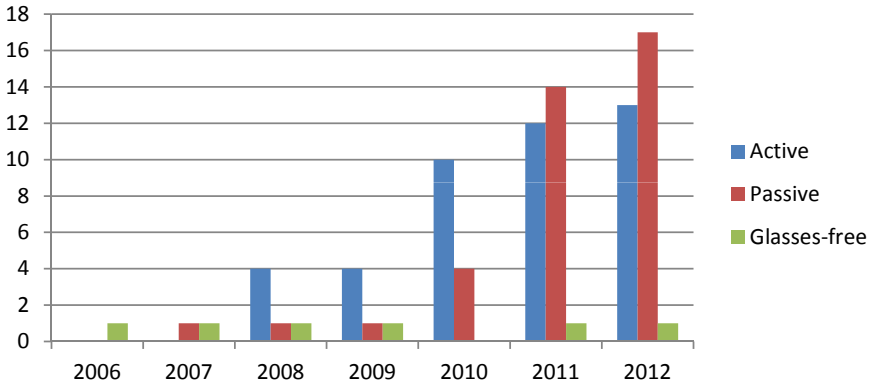
Appendix I: 3D TV Industry Structure (2006-2012)



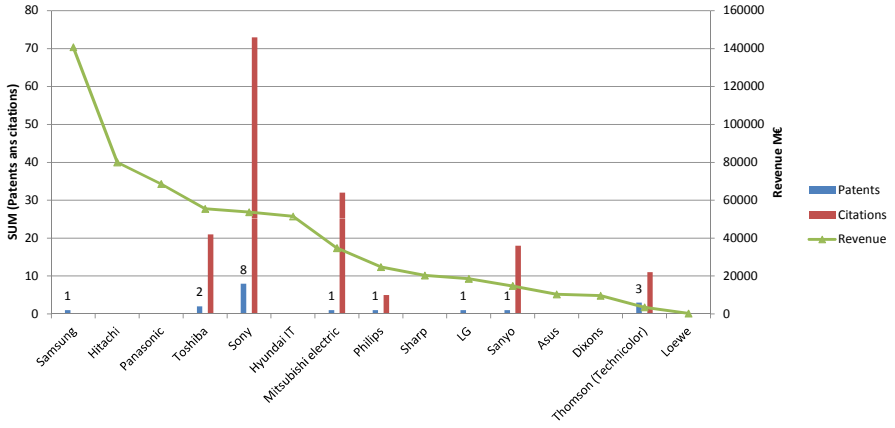
Appendix II: List of Firms in 3D TV Industry

Firm	Pre-entry Experience	Display Technology	Number of Patents	Number of Citations	Total Revenue at Entry (M€)	Total Revenue Now (M€)	Manufactures / Sub-contracts
Samsung	Yes	Active	1	0	94032	140770	Manufactures
Hitachi	yes	Glasses-free/Active(Shutter)	0	0	77140	80018	Manufactures
Panasonic	Yes	Active (Shutter)	0	0	71282	68576	Manufactures
Sony	Yes	Active (Shutter)	8	73	59720	53753	Manufactures
Huyndai IT	Yes	Passive	1	32	54634	51481	Manufactures
Toshiba	Yes	Passive/Active	2	21	49958	55482	Manufactures
LG	Yes	Passive	1	0	39130	18593	Manufactures
Mitsubishi Electric	Yes	Active	0	0	27743	34775	Manufactures
Philips	Yes	Passive/Active	1	5	25419	24788	Manufactures
Sharp	Yes	Active (Shutter)	0	0	22814	20330	Manufactures
Sanyo	Yes	Passive	1	18	14766	NA	Manufactures
Dixons	Yes	Passive	0	0	9660	9660	Sub-contracts
Asus	Yes	Passive	0	0	7645	10379	Manufactures
Thomson (Technicolor)	Yes	Active	3	11	3574	3500	Sub-contracts
VIZIO	Yes	Passive/Active	0	0	2175	NA	Sub-contracts
Loewe	Yes	Active (Shutter)	0	0	274,3	250	Manufactures
Cello	Yes	Passive	0	0	NA	NA	Manufactures
DigiHome	Yes	Passive	0	0	NA	NA	Sub-contracts
Manta	Yes	Passive	0	0	NA	NA	Sub-contracts
Sceptre	Yes	Passive	0	0	NA	NA	Sub-contracts
Finlux	Yes	Passive	0	0	NA	NA	Manufactures
Polaroid	No	Passive	0	0	NA	NA	Sub-contracts
Technika	Yes	Passive	0	0	NA	NA	Sub-contracts

Appendix III: Three Types of Technologies Offered in 3D TV Industry and the Cumulative Number of Firms that Offer Such Technologies



Appendix IV: Patents and Citations in Correlation to Revenue



Appendix V: Patents of Firms in 3D TV Industry

Patent Number	Patent Name	Issue Date	Firm	Cited
8,217,894	DTV capable of receiving signal from 3D pointing device, and method of executing function and adjusting audio property of DTV employing 3D pointing device	8.9.2008	**LG**	0
5,543,845	High efficiency encoding apparatus	28.4.1995	**Mitsubishi**	32
4,905,076	Three dimensional television system and projection television receiver	12.8.1986	**Philips**	5
8,203,599	3D image display apparatus and method using detected eye information	26.1.2007	**Samsung**	0
5,808,664	Method of converting two-dimensional images into three-dimensional images	11.7.1995	**Sanyo**	18
4,862,267	Motion compensated interpolation of digital television images	31.5.1988	**Sony**	63
5,825,124	Cathode-ray tube having activated green and blue phosphors	21.3.1996	**Sony**	2
5,835,162	Signal separator and television receiver having the same	19.7.1996	**Sony**	1
7,503,057	Client and server system	6.9.2001	**Sony**	7
8,261,210	TV widget animation with audio	2.4.2009	**Sony**	0
8,181,120	TV widget animation	2.4.2009	**Sony**	0
8,325,223	3D shutter glasses with mode switching based on orientation to display device	14.7.2009	**Sony**	0
8,370,873	3D TV glasses with TV mode control	9.3.2010	**Sony**	0
6,437,914	Projection televisions with holographic screens having center to edge variations	12.7.1998	**Thomson**	6
6,483,533	Projection televisions with three dimensional holographic screens	30.12.1998	**Thomson**	3
6,400,417	Projection television with three-dimensional holographic screen and centered blue CRT for balanced CRT drive	5.8.1999	**Thomson**	2
5,712,689	Digital television set	20.9.1995	**Toshiba**	21
8,339,441	Frame processing device, television receiving apparatus and frame processing method	8.6.2009	**Toshiba**	0

Applicability of the Industry Life Cycle Theory in United Kingdom's Remote Casino Industry

Riku Mäkelä, Sixten Blomqvist, Tuomas Sarkola, Jaakko Laukkanen

ABSTRACT

The technological progress of recent decades has had a significant effect on several established industries and organization populations. This research examines how fresh business opportunities enabled by modern communication methods have reshaped the traditional gambling industry and how the new remote casino industry has emerged. Our objective is to develop a profound understanding of the change that is happening in this particular industry and analyse our findings in the context of industry life cycle theory.

In this article, the authors reveal the findings of their study of the applicability of the industry life cycle theory with regards to the emergence of United Kingdom's remote gambling after the deregulation in 2007. The overall objective of the research was identifying the focus areas of the ILC theory – industry emergence, entry and exit rates and survival and success of firms – and testing each area of the theory with quantitative methods.

The industry life cycle theory is found very fitting in the UK gambling research context. The theory explains the emergence of the industry and the phenomena found in entry and exit rates rather well. The authors conclude however, that based on the available gambling data no conclusions can be drawn with regards to the performance of individual firms.

Lastly, the authors suggest further research with a broader geographical scope. This would enable better analysis of the performance and financial metrics of the companies in question, and also mitigate possible research risks related to focusing on a geographical niche.

1. Introduction

The technological progress of recent decades has had a significant effect on several established industries and organization populations. This research examines how fresh business opportunities enabled by modern communication methods have reshaped the traditional gambling industry and how the new remote casino industry has emerged. Our objective is to develop a profound understanding of the change that is happening in this particular industry and analyse our findings in the context of industry life cycle theory.

Gambling industry consists of several different segments each serving millions of customers including betting, bingo, lotteries and game machines (UK Gambling Commission 2012b). This research focuses on the developments in the casino industry that has arguably experienced the clearest transformation among the various gambling segments during the last decade. In this study different casino activities are classified under two categories. Non-remote gambling stands for traditional gaming, which takes place on physical premises dedicated for gambling while remote gambling covers virtual gaming, which enables customers to participate from the location of their choosing.

In order to create a clearly defined and feasible research setting the United Kingdom was selected as the target geographical area. Due to the local legislation the founding of online casinos was not allowed in the UK until 2007, which naturally limits the examination of company survival, but on the other hand provides an excellent opportunity to study the early years of a young industry. Moreover, the gambling industry is overall strictly regulated in the UK and thus examining the gambling licences approved by the authorities creates a sensible starting point for the study. (UK Gambling Commission 2012a)

In this research we are trying to investigate whether the emergence of remote casino industry follows the principles of industry life cycle (ILC) theory and what the key factors influencing the survival and success of the relevant companies are. We structure the study around several hypotheses that are derived from the ILC theory and the expectations of the research group. These hypotheses are tested through the quantitative analysis that provides the basis for discussion on the most essential dynamics influencing the remote casino industry. Finally, the reliability of results is evaluated and potential topics for further extended research are presented.

2. Industry Life-cycle Theory in the Casino Industry

This study focuses on the key mechanism of the industry life cycle theory and the theory's applicability to the re-

mote casino industry in UK. The ILC theory was chosen as the theoretical approach due to its wide focus on the underlying mechanisms that shape the industry emergence, the entry and exit rates within the industry and survival rates of firms entering the industry (Peltoniemi 2011). Other theoretical approaches such as the organizational ecology were considered, but not deemed as suitable for this study. Especially the low focus on industry discontinuity and emergence along with exit and entry rates, which is the main focus of this study, led us to exclude the organizational ecology approach (Baum and Shipilov 2006).

2.1 Industry Emergence

According to Klepper (1996) industry emergence is the product of a new technological opportunity which will result in a large number of entries into the industry. Ehrnberg (1995) explains that the technological opportunity can be seen as a discontinuity or a change in the (1) competence and other resources necessary for designing the product, (2) physical changes in the product itself and (3) changes in the price to performance ratio in the product. In the casino industry a clear discontinuity can be identified as the industry has shifted towards more computerized and software driven products (UK Gambling Commission 2012a). The industry product, which is the gambling service provided to the customers, has changed in all of the three dimensions proposed by Ehrnberg. First, the competence and resources necessary has changed from physical locations and large amounts of customer service personnel to software platforms, servers and software designers. Secondly, the product has changed physically from being a tangible experience in a physical location to an intangible online experience wherever the customer wants to consume the gambling service. Finally, the price of producing the casino gambling service has declined vastly while the performance has increased greatly. This is evident from the different cost structures of the non-remote and remote services: the non-remote service has high employee and rent expenses while the remote casino service operating costs are very small, consisting mostly of server costs[1].

Young industries are often dynamic and categorized in the entrepreneurial regime in contrast to the routinized regime (Audretsch 1991). The entrepreneurial regime is characterised by high level of widening innovation performed by new entrants compared to the routinized regime, which is distinguished from deepening innovations performed by incumbents (Peltoniemi 2011). The remote casino gambling can well be categorized in the entrepreneurial regime due to the young age of the industry, while the non-remote casino gambling is grouped into the routinized regime.

In addition to the shift in innovation activities, Peltoniemi explains that a maturing industry is characterized by the emergence of a dominant design. According to her, the dominant design decreases the variation in product characteristics. Thus, firms in a young and emerging industry should have more

1 This insight was derived from examining the financial data for 31UK casino gambling firms, gained from the ORBIS database.

variation in the products than the firms in a matured industry. In the casino industry the product can be defined as the specific gaming activities the casino offers such as bingo, lottery and betting. This can be measured by the number of licences the firm has for different gaming activities, since the casino has to apply for a separate licence for every type of activity it provides. Because younger remote casino firms should have more variation in their products according to the ILC theory we constructed the following hypothesis:

HYPOTHESIS 1. The remote casino firms have on average more licences than non-remote casino firms.

The main proposition of the ILC theory is that the industry transits into maturity when innovative efforts shift from product to process research and development (R&D) and there is a shakeout in the number of firms (Peltoniemi 2011). Klepper (1996) explains that this is caused by a size advantage in R&D, suggesting that the firms in a more mature industry are larger in scale. In addition, Klepper's proposition implies that the concentration in the industry should increase when it matures. Based on the ILC cost-spreading theory we formulated the following hypothesis:

HYPOTHESIS 2. The average size of a firm in the remote casino industry is smaller than the average size of a firm in the non-remote casino industry.

2.2 Entry and Exit Rates

Peltoniemi (2011) explains that young industries are very turbulent in terms of frequent entries and exits. The entries are heavily correlated with the exits resulting in a low net entry rate compared to the total entry rate (Geroski 1995). According to Peltoniemi, in the early phases of the ILC the entries are continuously increasing together with the total sales in the industry. The remote casino industry is very young and can therefore be expected to have a high and growing entry rate along with growing industry total revenue. Hence, our third and fourth hypotheses:

HYPOTHESIS 3. The remote casino industry has encountered a growing number of entries into the industry during the first five years of the industry's lifetime.

HYPOTHESIS 4. The total revenue of the remote casino industry has been growing during the first five years of the industry's lifetime.

While the non-remote casino industry acts as a great comparison for the remote casino industry, the proposition of that young industries are characterized by high number of entries and exits (Peltoniemi 2011) can be tested. Thus, our fifth hypothesis:

HYPOTHESIS 5. The total number of entries and exits compared to the total number of firms is smaller in the non-remote casino industry than in the remote casino industry.

2.3 Survival and Success of Firms

The ILC theory focuses heavily on the characteristics of successful firms in

terms of survival (Peltoniemi 2011). Due to the limitations of our data we could not directly measure how different characteristics affect the survival rate. Instead, we evaluated a variety of performance measures that could possibly have a correlation with the survival of the firm and investigated what characteristics of a firm might lead to higher performance measures. The performance measures used were the firm revenue, the firm profitability (profit/revenue) and firm efficiency (revenue/employees). The ILC theory states that there are three main characteristics which cause higher success: the entry timing, pre-entry experience and innovativeness of a firm (Peltoniemi 2011). The entry timing or innovativeness cannot directly be observed from our data which is why we focused on pre-entry experience. The pre-entry experience was measured by comparing firms that had experience from the casino industry before starting an online casino. That is, we defined *de novo* entrants to be firms with only remote casino licences and *de alio* entrants to be firms with both remote and non-remote licences. According to the ILC theory, de alio entrants usually have higher success than de novo entrants. Therefore, the following hypothesises:

HYPOTHESIS 6a. Firms with both remote and non-remote licences have higher revenue than firms with only remote licences.

HYPOTHESIS 6b. Firms with both remote and non-remote licences have higher profit/revenue than firms with only remote licences.

HYPOTHESIS 6c. Firms with both remote and non-remote licences have higher revenue/employees than firms with only remote licences.

3. Data Gathering and Description

The data gathering was conducted in three separate stages. Firstly, the United Kingdom Gambling Commission's annual reports from years 2007-2012 were used. From the reports, the total number of remote and non-remote licenses was extracted along with the amount of issued and surrendered licenses. The UK Gambling Commission is the government's official authority which admits the licenses to both remote and non-remote casinos, and thus the Gambling Commission was a natural choice for the primary source of information. In addition, the information about the industry and market size was extracted for the past five years from the UK Gambling Commission's year 2012 report "Industry Statistics from April 2008 to September 2011".

In the second stage of data gathering, the names of the companies holding gambling licenses were collected. Moreover, the different types of licenses each company possesses were mapped with the corresponding companies. Since the data was only available for the current year, the historic license data of individual companies could not be gathered. To collect the current license data, the research group used UK Gambling Commission's license search engine with the gambling sector restriction set as "Casino". The list of companies and the accurate description of the license types enabled the research

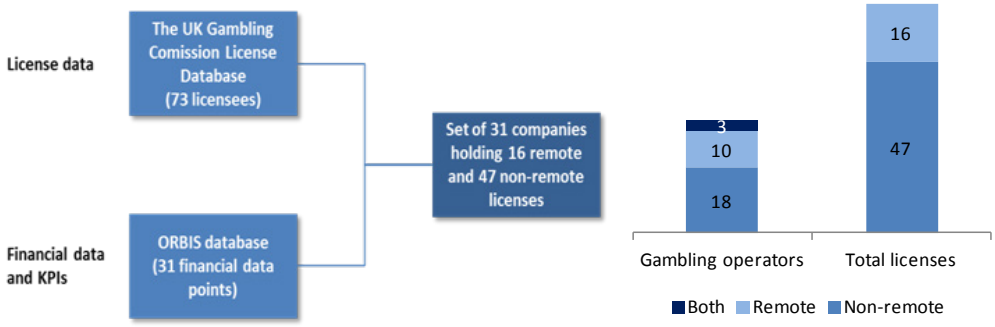


Exhibit 1. The data consolidation process and the composition of the data sample.

group to analyze the number of licenses of each current license holding company. The gathered data consisted of 73 licensees accepted by the United Kingdom's Gambling Commission. During our manual collection of data, it was found that out of the aforementioned licensees 71 were determined active by the same regulating body.

The third stage of data gathering was to find more detailed data for each of the current licensees. At this stage the research group exploited ORBIS corporate database and other public sources to access each company's dataset for recent years' revenue, profit, and the number of employees. This data was available for 31 of the gambling companies. Further investigation showed that the lack of financial data is a result of many of the companies being privately held by one to three shareholders and thus having less required accounting visibility.

Of the 31 companies for which financial data was available, ten hold only remote gambling licenses, three hold both remote and non-remote gambling licenses, and the remaining eighteen companies are only permitted to pursue non-remote gambling activities. Together, the 31 companies hold 16 remote and 47 non-remote gambling license types. The data consolidation process and the compositions of gambling operators and total licenses can be seen in Exhibit 1.

All the gathered data was acquired from governmental sources and other widely used, reliable service providers. Thus, the dataset can be described as reliable. However, the coverage of the financial data is not thorough because many of the companies do not have publicly available financial information. Also, the lack of detailed license data from years prior to 2013 complicates analyzing the developments of an individual company.

Exhibit 2 displays how the gathered data was applied in the analyses. The numbers refer to the amount of companies whose corresponding data was available in the sample.

Exhibit 2. The sample size and usage of the gathered data.

Data type	Industry data	License data	Financial & company data	Total Sample
Hypothesis 1	-	n = 73	-	**n = 71**
Hypothesis 2	-	n = 73	n = 13	**n = 13**
Hypothesis 3	-	n = 73	-	**n = 71**
Hypothesis 4	Yes	-	-	**-**
Hypothesis 5	-	n = 73	-	**n = 71**
Hypotheses 6a, 6b & 6c	-	n = 73	n = 13	**n = 13**

4. Analysis of the Data

After the initial data collection and structuring of all gathered information, our research group proceeded into the actual analysis phase of the study. The objective of the analysis was to address all the research hypotheses rigorously and one by one either verify or invalidate the conjectures. This chapter is structured accordingly and will demonstrate the logic behind the key analyses conducted in this study.

The test environment for HYPOTHESIS 1 was set up by acquiring data on all the licensed casino operators in the United Kingdom. Exhibit 3 presents the entire industry's license data consisting of 73 firms with a total number of 144 licenses across different gaming areas in remote and non-remote gambling sectors. The firms were divided into three categories for the analysis: firms with only non-remote licenses, firms with only remote licenses and firms with both non-remote and remote licenses. We categorized various gambling licenses under 5 remote and 6 non-remote business segments: Casino, Bingo, Betting, Lottery, Gambling Software (remote only), Equipment (non-remote only) and Gaming Center (non-remote only).

A company with licensed activity in remote bingo and casino, and non-remote pool betting would receive a remote value of two and a non-remote value of one. For the entire group of firms, the average values were calculated to analyse the differences in the scope of variation between remote and non-remote gambling operators.

HYPOTHESIS 2 was selected to analyse the size of the firms in the industry and develop findings on the R&D cost spreading drivers of the ILC theory. This analysis could have been conducted in three ways: concentration measures, such as the Herfindahl index (Brown et al. 1988) or four-firm concentration, industry structure analysis as function of average outputs (Peltoniemi 2013), or by calculating average firm sizes in both sub-industries over a given timespan.

We chose the latter because the available data from reliable sources supported this way of execution. As a measure of size we chose gross gambling

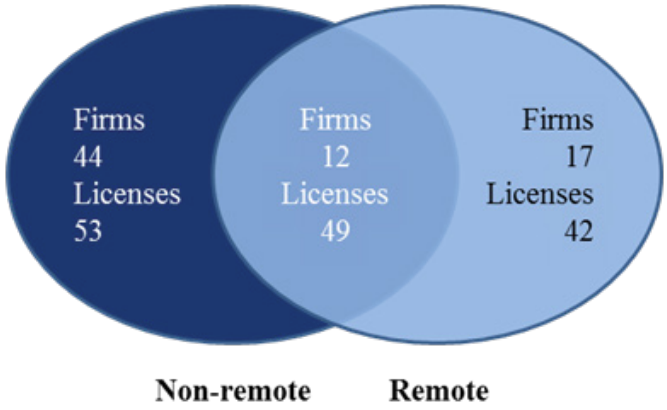


Exhibit 3. The UK casino gambling license data divided into non-remote and remote license holders.

yield. Gross gambling yield (GGY) is defined as total bets with the deduction of winnings payments. As the return rate on different games inside the remote and non-remote casino industries varies we feel that GGY serves as a good metric of size.

To calculate the average firm size we collected the total number of casino gaming licenses in the remote and non-remote industries. As one gaming company can only hold one casino gaming license, the number of casino licenses is the same as the number of firms. The average size was calculated as total gross gambling yield per total number of firms and plotted over the four years of examination (2008 – 2011).

In order to examine the entry and exit rates of gambling firms as stated HYPOTHESIS 3, we collected the UK Gambling Commission's license data from the relevant annual reports. The total number of casino licenses directly reflects the number of firms, as one gaming company can only hold one casino license. The Commission also collects data on new approved and discontinued licenses. We interpreted these as firm entries and exits. The entries, exits and total number of firms were plotted for examination.

To test HYPOTHESIS 4, the absolute revenues of the remote casino industry and its annual growth rates were derived and calculated from the industry statistics of UK Gambling Commission. The Commission annually reports the total industry revenue, and the gross gambling yield (GGY). We decided to use revenue rather than GGY as the measure of total size, because it more accurately represents pure volume. The relevant data was collected and plotted over the period of 2008 – 2012. Furthermore, we calculated the annual growth rates and 2008 – 2012 compound annual growth rate (CAGR) for the remote casino industry to emphasize the findings.

We validated the total revenue data by comparing partial sets of information with statistics gathered from the ORBIS database.

For HYPOTHESIS 5, we collected the UK Gambling Commission's data on total gambling licenses. The

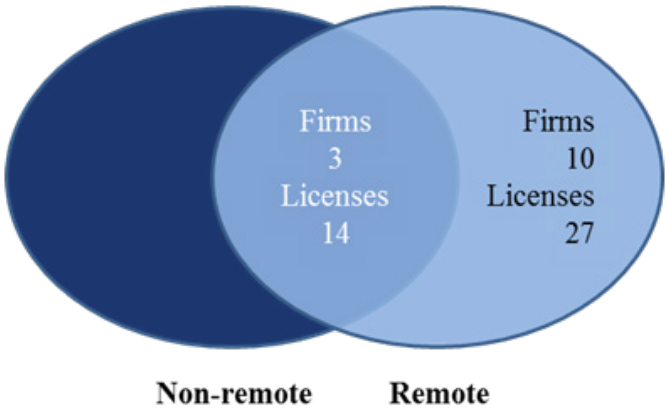


Exhibit 4. The division of UK casino gambling companies including only firms with financial data.

aggregate number of casino licenses directly reflects the number of firms, as one gaming company can only hold one casino gaming license. We interpreted the new license approvals and discontinued licenses as firm entries and exits.

The entries and exits in remote and non-remote industries were added together to reflect the full volume of traffic. Because the total number of remote and non-remote firms is very different, the entry and exit traffic was divided by the number of firms for each given year. We feel that this ratio reflects the total turbulence of the industry very well and is suitable for testing the underlying ILC theory: (entries + exits) / total number of firms.

Comparing this metric between the remote and non-remote industries allows us to identify which has more entry and exit activity proportional to size.

In order to understand success drivers and test HYPOTHESIS 6 for the remote casino industry, we compiled the license information retrieved from the UK Gambling Commission website and financial metrics from the ORBIS database. We categorized remote casino companies into two groups: Firms with both remote and non-remote casino licenses, and firms with remote casino license but no non-remote license. The division of companies into groups is presented in Exhibit 4.

We compared the two groups based on three different metrics. Revenue indicates the success in growing a sizeable business, profit margin measures the lucrativeness of the business and revenues-to-employees ratio functions as a proxy for productivity. For each chosen metric within a category the averages and medians were calculated and placed in a summarizing table.

5. Results

The hypotheses were analysed by setting up a test environment as described in the chapter 4. The outputs of each analysis were graphs or tables based on which the acceptance or rejection

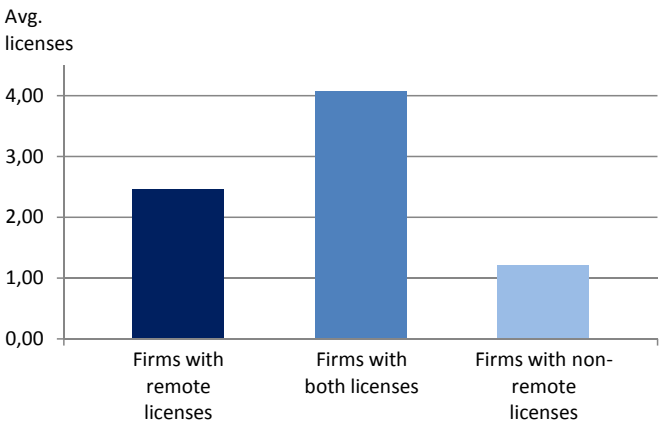


Exhibit 5. The average number of licenses across firms with only remote licenses, firms with only non-remote licenses and firms with both remote and non-remote licenses.

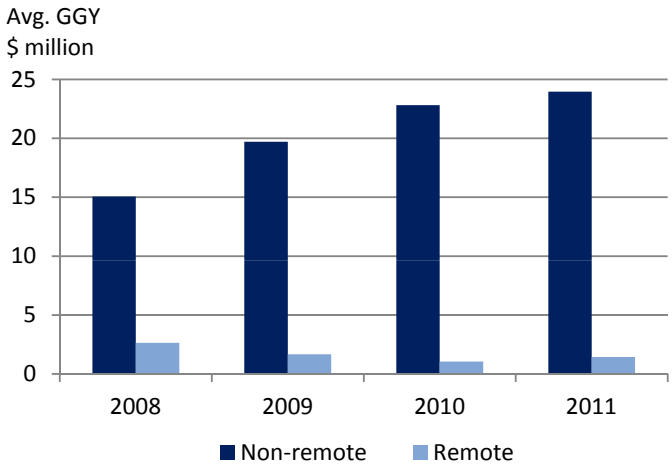


Exhibit 6. The average size of a firm measured by gross gambling yield in the remote and non-remote casino industries for the years 2008–2011.

of each hypothesis could be done. This section presents the aforementioned graphs and tables, summarizes the result of the hypothesis and presents brief analytical findings.

Exhibit 5 presents the analysis of HYPOTHESIS 1, or the average number of licenses across three groups: the firms with only remote licenses, the firms with only non-remote licenses and the firms with both types of licences.

The first hypothesis can be accepted based on the analysis. The firms with only non-remote licenses have on average licenses for 1,20 business segments. The remote-only firms on the other hand, hold on average 2,47 licenses. The largest number of licenses is held by the companies which operate in both the remote and the non-remote casino industry. They have 4,08 licenses on average.

Exhibit 6 illustrates the testing of HYPOTHESIS 2, by showing average size of a firm measured by gross gambling yield in the remote and non-remote casino industries across the examined timespan of 2008–2011.

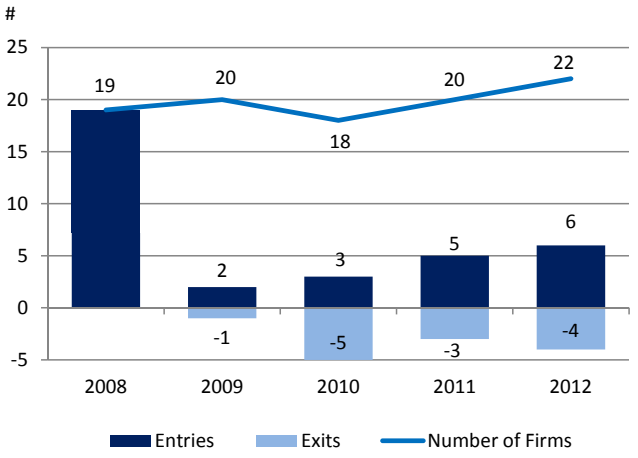


Exhibit 7. The total number of firms along with entry and exit rates in the remote casino industry.

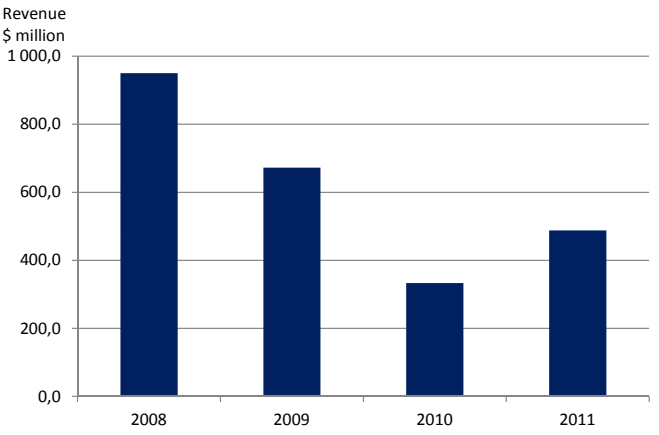


Exhibit 8. The total market size of the remote casino industry measured by revenue for the years 2008-2011.

Based on the analysis, the average size of a firm in the remote casino industry is much smaller than the average size of a firm in the non-remote casino industry resulting in acceptance of the second hypothesis. The remote casino firms have on average been only 9% of the size of non-remote casino companies. In fact, the average size of a remote casino firm has been decreasing while the average size of a non-remote casino firm has been increasing. In 2011 which is the last year of examination, the non-remote operators are approximately seventeen times larger than remote casino firms.

Exhibit 7 illustrates findings for HYPOTHESIS 3 in the form of the entry and exit rates in the remote casino industry.

Based on the analysis we can clearly say that the remote casino industry has been experiencing a growing number of entries since its deregulation, if the industry's first year 2008 is disregarded. Thus the third hypothesis is accepted.

The deregulation of online gambling in 2008 immediately led to a significant amount of initial entries. Annual examination after the regulatory change shows

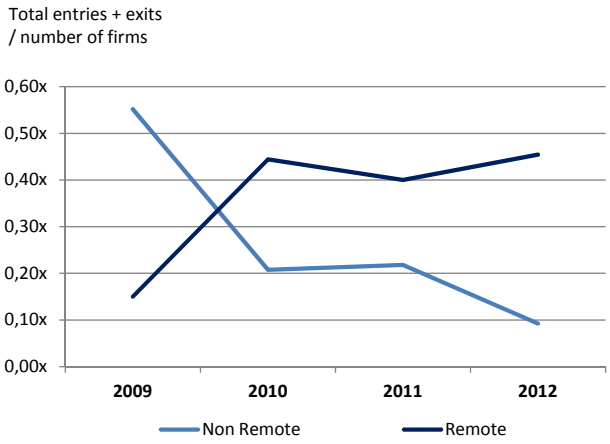


Exhibit 9. The total number of entries and exits divided by the total number of firms in the remote and non-remote casino industries.

smaller entry numbers, but the trend is clearly growing. Despite the growing number of entrants the total amount of licenses has stagnated around the 2008 level. This is in line with the emerging environment: as the entry rate increases the number of exits grows as well.

The results for HYPOTHESIS 4 are presented in Exhibit 8. It illustrates the development of remote casino industry revenue during the post-deregulation period of 2008–2011.

The aggregate revenues and thus market size for the remote casino industry have been decreasing rapidly since 2008 and thus the fourth hypothesis is rejected.

The annual changes since the deregulation in 2008 have been: -29%, -50% and 46%. The last year in the examination period shows slight signs of revival as the total revenues grew by approximately $150 million. This is only a small change though, as the compound annual growth rate (CAGR) for the industry between years 2008 and 2012 was -15,3%.

To provide comparison for the decrease in the size of the remote casino industry, we additionally calculated the growth rate for the entire remote gambling industry in the UK. The CAGR is 7,9% which clearly shows that only the remote casino segment is experiencing the observed changes.

Exhibit 9 illustrates the total number of entries and exits divided by the total number of firms in the remote and non-remote casino industries and tests HYPOTHESIS 5. We feel that this metric reflects the total entry and exit turbulence in each industry.

The analysis shows two key findings: in 2009 the non-remote casino industry was far more turbulent, with a ratio of 0,55 compared to the remote casino industry's 0,15. However, after 2009 the total entries and exits have been larger in the remote industry when scaled with the total industry size.

The entry and exit activity has been 2,1; 1,8 and 4,9 times higher in the remote casino industry during the years 2010 - 2012. Because of the difference in the ratio measuring industry turbulence, we can accept the fifth hypothesis.

Exhibit 10 shows the key ratios defined in HYPOTHESIS 6, which were

Exhibit 10. The key financial ratios calculated for the sample companies.

	Both licenses	Only Remote Casino License
Revenue ($ thousands)		
Average	254 650	84 945
Median	355 758	9 538
Max	392 344	375 094
Min	15 848	293
Profitability		
Weighted Average	8,9 %	7,2 %
Average	9,3 %	14,6 %
Median	10,3 %	17,7 %
Max	10,9 %	29,1 %
Min	6,8 %	-7,4 %
Revenue/Employees		
Weighted Average	102x	1504x
Average	104x	1001x
Median	103x	880x
Max	109x	2116x
Min	100x	75x
Sample Size	3	7-10

calculated for sample companies. The companies have been divided by licensed areas into firms with only remote licenses and firms with remote and non-remote licenses.

Firms with both remote and non-remote casino licenses in the sample have on average higher revenues. Based on this the hypothesis 6a can be accepted. However, the firms holding only remote casino licenses have higher profitability (profit per revenue) and productivity (revenue per employee) ratios. These findings lead to the rejection of hypotheses 6b and 6c.

For further validity, the revenue, profitability and productivity metrics were individually analysed between the two categories. Exhibit 11 illustrates the revenues of sample companies categorized into firms with only remote licenses and firms with both licenses. As seen in Exhibit 11 firms with both licenses are higher on the revenue scale than firms with only remote licenses.

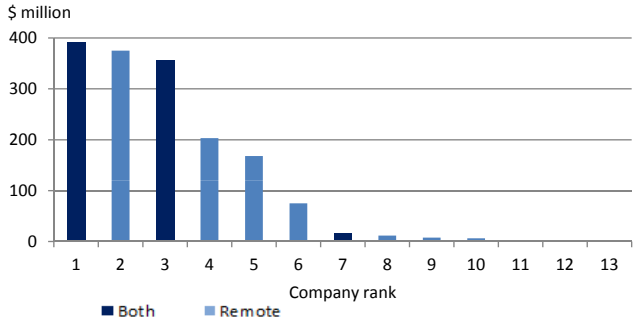


Exhibit 11. The revenues of sample companies categorized into firms with only remote licenses and firms with both licenses.

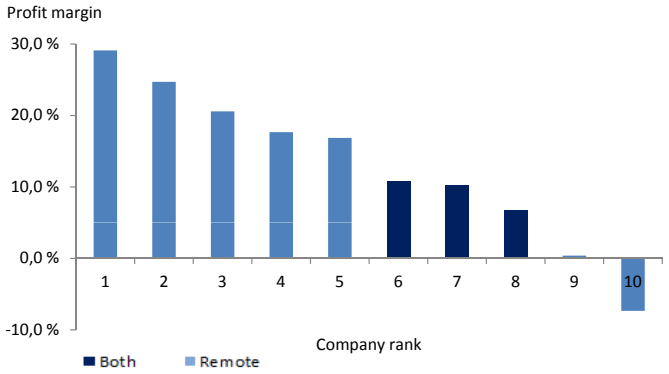


Exhibit 12. The profitability (profit per revenue) of sample companies categorized into firms with only remote licenses and firms with both licenses.

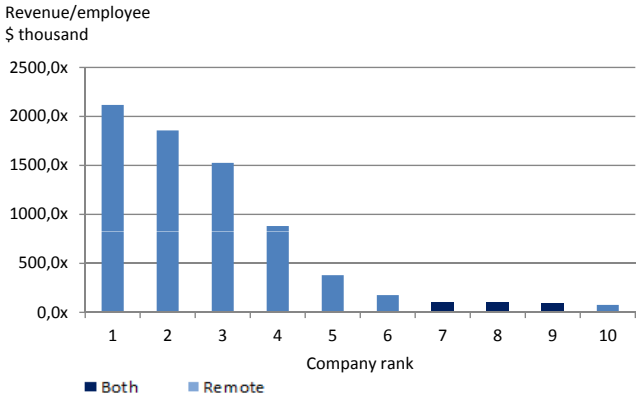


Exhibit 13. The productivity ratio (revenue per employee) of sample companies categorized into firms with only remote licenses and firms with both licenses.

Exhibit 12 represents the profitability (profit per revenue) of sample companies categorized by license type. The illustration clearly shows the higher profit margins of firms not involved in traditional casino business.

Exhibit 13 displays the productivity ratios (revenue per employee) among analysed companies categorized by license type. Again, firms focused on the remote casino business perform well in comparison.

6. Discussion and Conclusions

In this chapter the results are discussed and the theoretical along with the practical implications of the findings are presented. The discussion is divided by the theoretical approaches of the ILC theory as presented in the theory chapter. Exhibit 17 shows the main findings of the research in the form of hypotheses, and the hypotheses' connection to the underlying theory.

6.1 Industry Emergence

Based on the results gained in the analysis, we can firmly say that the hypotheses 1 and 2 support the ILC theory in the emerging phase of the industry. The basic rules in ILC theory suggest that a technological discontinuity provides a business opportunity for new entrants (Klepper 1996) and in the UK casino industry this was clearly evident as a large amount of remote casinos entered the industry after the deregulation of internet gambling.

Exhibit 17. The main findings of the research.

Theory	Hypothesis	Result
Industry Emergence	*HYPOTHESIS 1. The remote casino firms have on average more licences than non-remote casino firms.*	**Accepted**
	HYPOTHESIS 2. The average size of a firm in the remote casino industry is smaller than the average size of a firm in the non-remote casino industry.	**Accepted**
Entry and Exit Rates	*HYPOTHESIS 3. The remote casino industry has encountered a growing number of entries into the industry during the first five years of the industry's lifetime.*	**Accepted**
	HYPOTHESIS 4. The total revenue of the remote casino industry has been growing during the first five years of the industry's lifetime.	**Rejected**
	HYPOTHESIS 5. The total number of entries and exits compared to the total number of firms is smaller in the non-remote casino industry than in the remote casino industry.	**Accepted**
Firm Survival	*HYPOTHESIS 6a. Firms with both remote and non-remote licences have higher revenue than firms with only remote licences.*	**Accepted**
	HYPOTHESIS 6b. Firms with both remote and non-remote licences have higher profit/revenue than firms with only remote licences.	**Rejected**
	HYPOTHESIS 6c. Firms with both remote and non-remote licences have higher revenue/employees than firms with only remote licences.	**Rejected**

The ILC theory suggests that the younger industries have more variation in their product offering than mature industries (Peltoniemi 2011). This is clearly visible in the average numbers of licenses held by remote and non-remote casinos, as presented in the analysis of the first hypothesis. Moreover, firms with remote activities do not only focus solely on one platform or license area such as casino operations, but prefer venturing into other technical domain such as bingo, pool betting and other forms of gambling. This breadth of product and service variation shows that the remote gambling industry is in an emergent face and more agile in comparison to the already routinized and older regime of non-remote gambling (Audretsch 1991). The larger amount of licenses held by a remote casino might also be explained through the ease of new product introductions in the internet environment, compared to new physical premises, tables and other equipment demanded by the non-remote players if they were to introduce new types of games.

The rather young remote casino industry is characterized by a small average size of companies compared to traditional non-remote casinos, as analysed in the second hypothesis. This finding supports the ILC theory because of the consolidation, cost spreading and amount of time for growth that the companies in the more mature non-remote industry have had. However, there was one deflection in the data from the theory: the average size (GGY) of remote casinos seems to have been decreasing over time instead of growing. This way the remote casino industry would seem to show signs of maturity even though the basic assumption was that the five-year-old industry would be in the emerging phase. We think this is an interesting finding which should be further investigated in future research. Tentatively, we found three possible explanations for such industry behavior: (1) the remote gambling industry has been legal in many other geographies for nearly a decade longer, and thus good existing platforms could be acquired quickly with no need for product development - resulting in fast maturation; (2) remote gambling operators are subsidiaries of non-remote companies, which were set-up with high initial investment and pre-entry experience resulting in unusually quick maturation; and (3) the end users have switched to international gambling operators, resulting in a decrease in GGY margins but no failures have occurred since the firms have been exceptionally profitable. The phenomenon would be more understandable if the industry would have existed for longer but after only five years it seems abnormal.

As a conclusion, we still can say that the emerging phase of the remote casino industry supports the ILC theory in light of the amount of greater variation and the difference in average sizes of remote and non-remote companies.

6.2 Entry and Exit Rates

The UK remote casino industry was created nearly overnight after the deregulation in 2008. The Gambling Commission announced the upcoming deregulation already in 2005 which helped the interested companies prepare for the new industry emergence well in advance (UK Gambling Commission 2012b). In several other coun-

tries remote casino and other remote gambling had existed already for nearly a decade before the UK deregulation and thus the UK companies were able to imitate some of the best practices from remote casino companies operating outside UK. The analysis under the third hypothesis shows that the total number of license holders has remained close to the 2008 level, which seems odd for an emerging industry. Given the circumstances, we can draw a conclusion that the pre-entry experience and the special setting on the moment of emergence of the industry result in the fact that the remote casino industry was already rather mature at the time of the deregulation.

The ILC theory suggests that a young emerging industry should be growing in terms of revenues. This was investigated under hypothesis 4. The finding that the overall industry revenues were actually not only stagnating but rapidly decreasing disputes the ILC theory and thus came as a surprise to the group. This finding also supports the idea that the remote casino industry was born rather mature. Another confusing issue is that the total remote gambling industry has been growing in terms of revenues on average 7,9% per annum during 2008 – 2011. One explanation could be that the customers have easy access to global gaming sites operated outside the UK legislation. Unfortunately the Gambling Commission could not provide us with an explanation for this even though we contacted them directly (Foster 2013). This would be an interesting subject of further research.

Despite the surprising findings in the industry's revenues the entry and exit rates have behaved in a way the ILC theory proposes for a young emerging industry. The ratio applied in the analysis of hypothesis 5 shows that the remote casino industry is significantly more turbulent than non-remote casino industry. According to the theory about entry and exit rates in industries in different life-cycle phases, this proves that the non-remote industry is actually a mature and stagnating industry whereas the remote industry is young and continuously gaining new entrants.

6.3 Firm Survival

The firms which provide both remote and non-remote casino services outperform the ones with only remote operation in terms of higher revenue in accordance with hypothesis 6a. However, in terms of profitability (profit per revenue) and productivity (revenue per employee) the remote casinos easily outperform the traditional casinos, rejecting hypothesis 6b and 6c. A remote casino's internet platform is not limited by any physical boundaries and thus even a company operated by one employee can serve millions of customers per day. Therefore, the remote casino's better performance is simply a result of fewer personnel needed to run the business and the absence of limitations such as physical tables for customers. The technological superiority of remote casinos is at its clearest here. Because of the benefits the internet technology offers for the firms with no non-remote activities, the profitability and efficiency measures are not directly comparable in terms of survival. Hence, we cannot directly say that firms with only remote licenses would have higher possibility to survive although those firms scored better in the

analysis. As a consequence, practical managerial implications regarding the survival of a firm cannot be concluded from the research.

6.4 Reliability and Validity

The quality concerns of a study are usually categorized into issues of internal validity, external validity and reliability. Internal validity refers to the extent the research findings capture the reality of the phenomenon along with the credibility of the findings. External validity is concerned with the extent the findings from the research can be generalized to other situations. Reliability refers to extent the findings of the study can be replicated or the degree of similar results an identical study would deliver. (Saunders et al. 2007)

The internal validity of our results is relatively good. We used variables that have been used in previous studies and hence have been proven to capture the reality of the phenomenon. The only limitation was in the measurements of the survival rates. In those measures we had to rely on proxy measures as we did not have the direct access to the actual variables that should have been measured according to the theory. The data for the measurements was gathered from the regulatory body of the industry, which makes the data very reliable. Therefore, the measurements should be valid and not be biased by issues regarding the data collection. However, the major issue affecting the internal validity negatively is the global reach of the industry, enabled by the Internet. While the service is delivered over the web, firms from other regions can easily deliver services to the UK without a UK license. Although this might be illegal, it is the reality in the remote casino industry. This issue affects the internal validity of the study since we cannot be sure how measuring the firms with UK gambling licenses really reflect the UK gambling industry as a whole.

The external validity of our results could be considered somewhat low because of sampling features. Our company cohort comprises mostly of public firms with gambling licenses, and as such is not an accurate representation of the wider industry. However, external validity was improved by striving to report the findings with enough detail so that the reader could determine which findings are bound to the context and which can be generalized (Saunders et al. 2007).

In terms of reliability, we deem our description of the research data and method to be strong. Describing the used methods and the conducted analysis in detail so that the reader could with this information replicate the study increased the reliability of this study. Moreover, computer software was used in the analysis in order to increase the transparency and methodological rigour of the study (Saunders et al. 2007).

6.5 Further Research

The topic surrounding the emerging remote casino industry is very interesting, although we note numerous challenges in its empirical investigation. Especially restricting the scope to one single geographical area, although most of the firms in the industry have a global reach, creates issues for validity and reliability.

In order to derive more valid and reliable results we suggest further research with a significantly larger sample size. The enhanced firm sample should include firms with licenses from other regions in order to create a holistic view of the industry. Moreover, with more companies the amount of measurable financial metrics can be increased, which adds a direct business perspective and practical relevance for the study. Furthermore, by expanding the sample size more analyses related to the ILC theory could be conducted that could not be performed with our current data. These analyses could include a more rigid breakdown of the factors that impact a firm's survival in the remote casino industry.

The issue that would be most interesting for further research is to clarify the cause for the decreasing total revenue of the remote casino industry in UK during 2008-2010. Since we did not have the data and resources to investigate the causes in depth, a thorough study with a larger data sample could give more insight into the phenomenon. Thus, we could only propose three hypothesises for the causes that could be tested with further research.

References

Audretsch, D.B. (1991). New-firm survival and the technological regime. Review of Economics and Statistics, Vol. 73, pp. 441–450.

Baum, J.A.C. & Shipilov, A.V. (2006). Ecological approaches to organizations. In S. Clegg, C. Hardy, W. R. Nord & T. Lawrence (Eds.), The Sage handbook of organization studies, Sage Publications, London: pp. 55-110.

Brown, Donald M., Warren-Boulton, Frederick R. (1988). Testing the Structure-Competition Relationship on Cross-Sectional Firm Data. Discussion paper 88-6.

Ehrnberg, E. (1995). On the definition and measurement of technological discontinuities. Technovation, Vol. 15, pp. 437– 452.

Foster, S. (2013). Gambling commission license interview. Interviewed by Riku Mäkelä [telephone], 19.3.2013.

Geroski, P.A. (1995). What do we know about entry? International Journal of Industrial Organization, Vol. 13, pp. 421– 440.

Klepper, S. (1996). Entry, exit, growth, and innovation over the product life cycle. American Economic Review, Vol. 86, pp. 562–583.

Peltoniemi, M. (2011). Reviewing Industry Life-cycle Theory: Avenues for Future Research. International Journal of Management Reviews, Vol. 13, pp. 349-375.

Peltoniemi, M. (2013). Industry life cycle and dominant designs. TU-91.2018 Industry Evolution P, Lecture Slides: Lecture 2.

Saunders, M., Lewis, P. & Thornhill, A., 2007. Research methods for business students 4th ed., Harlow: Pearson Education Limited.

UK Gambling Commission (2012a). Gambling Commission Annual Reports and Accounts 2011/12. London: The Stationery Office.

UK Gambling Commission (2012b). Industry Statistics from April 2008 to September 2011. Available: http://www.gamblingcommission.gov.uk/pdf/industry%20statistics%20-%20june%202012.pdf [referred to: 22.2.2013].

Legitimation in snus industry

Hukkinen, S., Salonen, O., Savelainen, T., Sippola, L.

ABSTRACT

New snus manufacturers have been founded in the recent years despite the restrictive legislation on the tobacco industry by the European Union. In this study, we took an organizational ecology approach and examined whether entry and exit rates in snus industry in Europe can be explained through legitimation. We concentrated on studying sociopolitical legitimation through its regulative and normative dimensions. We limited our study to the years after 1992. Entries and exits were the dependent variable in the study. Regulatory legitimacy and normative legitimacy were the independent variables. Regulatory legitimacy was studied by tracking regulatory events in Europe and normative legitimacy by examining snus consumption in the main markets. Our study suggests that neither regulatory legitimacy nor normative legitimacy explains the increasing entry rates in the snus industry. The limitations of the study concern possibly missing entries and exits in the used dataset and the chosen research perspective on measuring normative legitimacy.

1. Introduction

The European Commission and Swedish oral tobacco (later referred to as snus) producers have been in war since the end of 2012. In December 2012, the European Commission announced that in the next health directive, the regulation on tobacco industry will be tightened with requirement that all tobacco products include 85% tobacco at minimum. The European Commission also intends to ban the use of flavors in tobacco products. Of all tobacco products, these regulatory changes have the greatest effect on snus. (europa.eu; Kauhanen, 2012)

However, the regulatory actions against snus have started long before this particular fight: U.K. was the first country to ban snus due to concerns over mouth cancer in 1988. In 1992, EU followed with a union-wide ban on new oral tobacco products. (Haydon, 2012) Sweden joined the EU in 1995 with a specific opt-out from the ban, which allowed Swedish snus companies to continue their business within the country borders. (ec.europa.eu) Thus, the fight over the next health directive is just the latest sign of the decreasing regulatory legitimacy of oral tobacco industry.

The regulations on tobacco industry aim at decreasing consumption by limiting the selling and the manufacturing of snus. However, several new manufacturers have been founded in the past ten years, for example, Swedish Skruf Snus AB in 2002, the Norwegian company Scandinavian Premium Tobacco AS in 2004, and Danish V2 Tobacco in 2006. Hence, it seems that the strategy of EU has not had the pursued effect.

We are interested in seeing whether the EU-wide legislation had the desired effect on the snus industry. Therefore, we study the legitimation of the snus industry. We will approach our research problem through the theory of organizational ecology. Organizational ecology offers a framework for studying the impact of legitimation on industries' evolution. Our research problem is:

» How have the entry and exit rates evolved in snus industry and can we explain this with legitimation?

We will approach the problem by studying the following questions:

» How has the snus manufacturer population evolved throughout the 1990s and 2000s?
» Can we explain entry and exit rates with regulatory legitimacy?
» Can we explain entry and exit rates with normative legitimacy?

We will limit our study to the years after 1992. This was the year EU banned the selling of snus in its member countries (Haydon, 2012).

2. Literature review

Organizational legitimacy is traditionally defined as the acceptance of the organization by its environment and it is considered to be vital in organizations' survival and success (Hannan & Freeman, 1977; Meyer & Rowan, 1977). It is not the only factor affecting whether the industry will grow from a few pioneers to fully realized growth. Many other issues, such as, the state of the economy, competitive pressures from related industries and the skills of new venture owners, are also relevant determinants of industry success. However, organizational ecology has focused on legitimacy since, within the theory, it is considered to be more important than the latter mentioned (Aldrich & Fiol, 1994).

Hannan (1986) named the growth in firm numbers as the primary force increasing the legitimacy of an industry. In a young industry in which the number of organizations is low organizations are thought to have higher probability to fail since they have to learn new roles without role models and establish ties within the industry that does not yet recognize their existence (Hannan & Carroll, 1992). As the number of firms increase, organizations raise their legitimacy along two dimensions: cognitive and sociopolitical. Cognitive legitimacy refers to knowledge about the new activity and means to survive and succeed whereas sociopolitical legitimacy is thought as the value placed on an activity by cultural norms and political authorities. (Aldrich & Fiol, 1994)

Cognitive legitimation can be assessed by measuring the level of public knowledge about a new activity. According to Hannan and Freeman (1986) highest level of cognitive legitimacy is reached when an activity becomes so familiar and well-known that it is taken for granted. For a producer, cognitive legitimation means that new entrants are likely to copy an existing organizational form, rather than experiment with a new one. From a consumer's point of view, it means that people are knowledgeable users of the product or service.

Sociopolitical legitimation refers to a process by which key stakeholders, the general public, key opinion leaders, or government officials accept the venture as appropriate and right. Aldrich and Fiol (1994) list that sociopolitical legitimation can be measured e.g. by assessing public acceptance of the industry or government subsidies of the industry.

Johnson et al. (2006) and Scott (1995) divided sociopolitical legitimacy into two subcategories: regulative legitimacy and normative legitimacy. Regulative legitimacy is the part that Aldrich and Fiol measured through government actions. It stems from actors who have some sort of sovereignty over organizations, such as regulatory agencies associated with governments and who, therefore, determine the range of what is legally acceptable. Normative legitimacy comes from actors who define what is morally desirable. This can be measured e.g. by public acceptance.

In this study, we will examine legitimation of the snus industry and its relation to entry and exit rates of organizations. We will concentrate on studying sociopolitical legitimation through its regulative and normative dimensions. Cognitive legitimacy is out of the scope of this study.

3. Data and method

3.1 Data on entries and exits

Entries and exits are the dependent variable in our study, i.e. we are trying to determine the changes in these rates with our independent variables. Entry numbers reflect the appeal of an industry, while exit numbers depict the survival of organizations in an industry (Hannan, 1986).

We searched the Orbis database for companies situated in Sweden, Norway, or Denmark that have "Manufacture of tobacco products" as either their primary or secondary code for industry classification. This resulted in a total of 60 companies. Out of these, 39 could successfully be identified as snus manufacturers based on Internet research from companies' websites and other sources. In addition, we found two companies outside of Orbis from Internet-based business directories, such as allabolag.se (2013). Out of these companies, a clear majority of 25 were situated in Sweden, while in Denmark and Norway the counts were eight for both countries.

We determined the entry years of companies by the year of incorporation found in Orbis. Of the 41 snus manufacturers identified 34 made an entry within the time period investigated. A company was classified to have made an exit if its status was either "Dissolved" or "Bankruptcy", and the corresponding year or exit was determined by the status date. The data was complemented with information from other business directories such as The Brønnøysund Register Centre (2013).

3.2 Data on regulatory legitimacy

The regulatory legitimacy of snus industry, the other independent variable in this study, was analyzed based on two primary data sources. First, the regulatory acts defined in the Article 288 of the Treaty on the Functioning of the European Union were gathered from the European Comission's database (ec.europa.eu) where key documents of tobacco legislation and policy are presented. This data source contains the key regulatory acts linked to tobacco industry between 1992 and 2012. According to Article 288, the European Union can use its power to control tobacco market through regulations, directives, decisions, recommendations and opinions. A regulation is directly applicable in all member states of the EU. A directive requires member states to achieve a certain result but it does not dictate the means. A decision is binding upon those to whom it is addressed. Recommendations and opinions have no binding force.

Secondly, Swedish legislation on tobacco products was used as a data source because a significant majority of all companies producing snus in Europe are Swedish. In addition, the consumption of snus in Sweden is very high compared to other EU countries (WHO, 2007). The Swedish law concerning tobacco products is Tobakslag (1993:581). The law was legislated in 1993 and amended 11 times between years 1994 and 2012.

The reason to include both Swedish and EU legislation stems from the findings of previous studies. Aldrich and Fiol (1994) find that institutions

have often higher ability to influence on country-level legislation than international laws. This is due to geographical distance and established relationships that enable lobbying as well as governments interest in supporting local businesses. Therefore, it could be possible that even if the EU legislation towards snus is tightening the Swedish legislation could show signs of increasing regulatory legitimacy.

The same research method was used for both data sources. First, all the regulatory events linked to tobacco were tracked between 1992 and 2012. Then the events were categorized according to the legal basis: the categories are regulation, directive, decision and recommendation. Finally, the direct effect on snus industry of each of the tracked regulatory event was evaluated whether it's extremely tightening, tightening, neutral, loosening or extremely loosening. The evaluation is based on the research group's opinion on how directly the event has impact on snus industry. Extremely tightening or extremely loosening events are regulatory events that directly concern snus. Tightening and loosening events are regulatory events that do not primarily concern snus but they do have a clear impact on snus too. Neutral events are regulatory events that do not influence snus industry at all but they are targeted to other tobacco products.

The total effect of regulatory events was analyzed through taking into account both the legal basis and the evaluation of the direct effect on snus industry. Both the legal basis categories and the evaluations of the direct effect were quantified. The categories of legal basis were given values from 1 to 4 so that the most powerful legal act, that is regulation, was valued as 4 and the weakest legal act, that is recommendation, was valued as 1 (see Table 1). The direct effects on snus industry were given values so that extremely tightening is +2 and extremely loosening is -2 and other effects are uniformly distributed between those (see Table 2). The total effect of each regulatory event was then calculated by multiplying the legal basis value and the value of the direct effect on snus industry. As a result, the bigger the total effect value is, the more tightening the regulatory event towards snus industry has been. If the result is negative, the event has been loosening towards regulation of snus industry. In the end our assumption is that tightening regulation means that the regulatory legitimacy of snus industry decreases and loosening regulation means that the regulatory legitimacy of snus industry increases.

Table 1. Value of legal basis

Legal basis	Value
Regulation	4
Directive	3
Decision	2
Recommendations, proposals	1

Table 2. Value of direct effect on oral tobacco industry

Direct effect on snus industry	Value
Extremely tightening	2
Tightening	1
Neutral	0
Loosening	-1
Extremely loosening	-2

3.3 Data on normative legitimacy

As we noted earlier, the normative dimension of sociopolitical legitimacy, the other independent variable in this study, can be measured with public acceptance towards the industry. In this view, legitimation is the process of becoming acceptable and normative to an audience. Therefore, we collected data on snus consumption to find signs of changes in the social acceptance of snus. Our basic assumption is that when snus becomes more socially acceptable, its use and experimenting rates increase. Similarly, when the social acceptance declines, use and experimenting rates decline.

The particular type of oral tobacco that we investigate is the Swedish snus. According to an association that represents the industry, the European Smokeless Tobacco Council (ESTOC), the majority of snus is sold in Sweden: The number of snus users was approximately 1.2 million in 2007 in Sweden. Snus is also widely used in Norway, with 309 000 snus users in 2006, and in Finland with 100 000 users. Snus is very little used outside Scandinavia. (www.estoc.org) We use consumption data from Sweden, because it is the absolute biggest market of snus. We also included data from Finland to broaden the examination to cover a wider geographical area where snus is used. If the attitudes towards snus have changed in the past two decades, we expect to find a sign of that change in the combined data from Sweden and Finland.

The use of snus is regularly followed especially among adolescents but also among adults in Finland and in Sweden. In the data collection and reviewing process, we quickly saw that the snus habits of Swedish adults have remained stable in the past decade. During 2004-2011, the share of non-users has steadily remained close to 80%, and users and former users compose the remaining 20% of 16-84-year-old Swedes (www.fhi.se). We concluded that snus is a very steady habit among adults: It is a habit which is difficult to quit, and therefore, consumption extremely slowly reflects the changing attitudes towards snus. However, a way to find hints of attitude changes is to investigate the use and experiment rates of adolescents who have not yet created a sticky habit out of snus, and who are more easily influenced by the attitudes of the social environment.

In Finland, the use of tobacco products among 12–18-year-old adolescents is surveyed once in two years in the Survey of Adolescent Health (Nuorten terveystapatutkimus). The surveys have been done since 1977 and they are comparable with each other. For example in 2011, 4566 adolescents responded to the survey (47% of the population that the questionnaire was sent to). We use the data on snus habits of Finnish adolescents gathered in these surveys and published by Raisamo et al. (2011). In Sweden, the snus habits of students in the 9th school year have been surveyed yearly since 1971. We use data from these surveys, published by Henriksson and Leifman (2011). For example in 2011, 4632 students responded to the survey. The samples are selected randomly and represent the entire population.

4. Results

4.1 Entries and exits

The yearly entries and exits are presented in Figure 1.We can see that there have been entries throughout the time period, despite the supposed decreasing legitimacy of the industry. According to our dataset it seems that the entry numbers have been rising during the course of time. We could find nine exits in the previously determined dataset. All of the exits were from the years 2002-2012. We can see that most of the exits occurred in 2009 and 2010, which might be related to the financial crisis in 2008. In addition, majority of these exits (six in total) were in Norway, while Sweden had two exits and Denmark one.

4.2 Regulatory legitimacy

The first and also the most powerful tightening regulatory event concerning snus industry between 1992 and 2012 has been the directive (Council Directive 92/41/EE) that banned the supply of tobacco for oral use in all EU member countries in 1992. This was the start for EU's goal to decrease the regulatory legitimacy of oral tobacco products. The only exception is the opt-out for Sweden in the year 1995: Sweden joined the EU and negotiated an opt-out from the ban on oral tobacco which allowed Swedish oral tobacco companies to continue their business within the country borders (Haydon, 2012). EU's and Sweden's regulatory acts concerning tobacco industry between 1992 and 2012 are presented in the appendices.

After the loosening opt-out regulation, the European Union has consistently introduced directives to tighten the regulation on tobacco industry. In 1997, a directive to regulate television advertising of tobacco products was introduced. In 2001 the Tobacco Product Directive was introduced: it regulated the composition and labeling of tobacco products. In 2003 Tobacco Advertising Directive banned cross-border advertising of tobacco products in printed media, radio and on-line services. In 2007 so called Audiovisual Media Services Directive extended the Tobacco Advertising Directive to all sorts of audiovisual communications. (Tiessen et al., 2013; ec.europa.eu) In December 2012, the

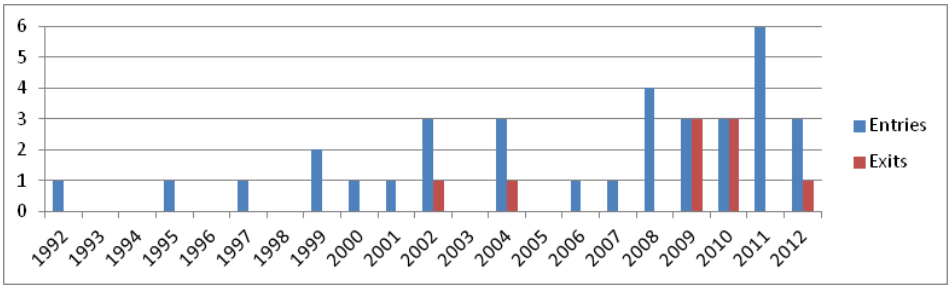


Figure 1. Entries and exits 1992-2012

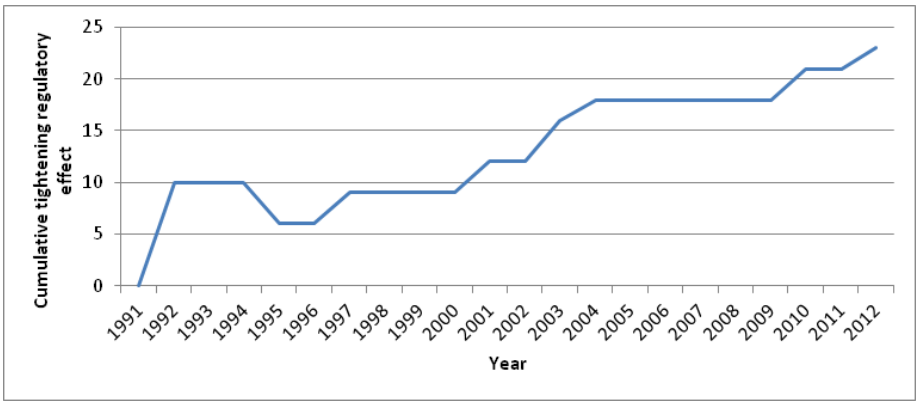


Figure 2. Regulatory acts on snus based on the EU's legislation

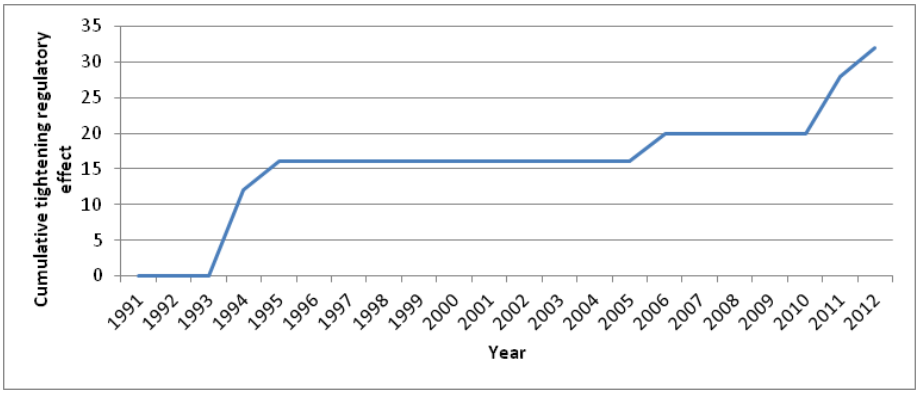


Figure 3. Regulatory acts on snus based on the Swedish legislation

European Commission announced that in the next health directive, the regulation on tobacco industry will be tightened with requirement that all tobacco products include 85% tobacco at minimum. The European Commission also intends to ban the use of flavors in tobacco products. Of all tobacco products, these regulatory changes have the greatest effect on snus (europa.eu; Kauhanen, 2012).

At the same time when the EU has tightened the laws the Swedish government has had two time periods when the law concerning snus has been clearly tightened. The first one was in 1994 and 1995 just before Sweden joined the EU. After that there was 10 years without any change concerning snus in the law. After 2006 the regulation on snus has been tightened three times. (Tobakslag, 1993)

There have been also some regulatory acts that might have resulted in a loosening effect on snus regulation. Between the years 2002 and 2004, oral tobacco manufacturers tried to challenge the EU ban on snus but in 2004 the directive 92/41/EE was uphold by the European court of justice (Haydon, 2012). In 2009, the EU recommended member states to adopt laws that protect

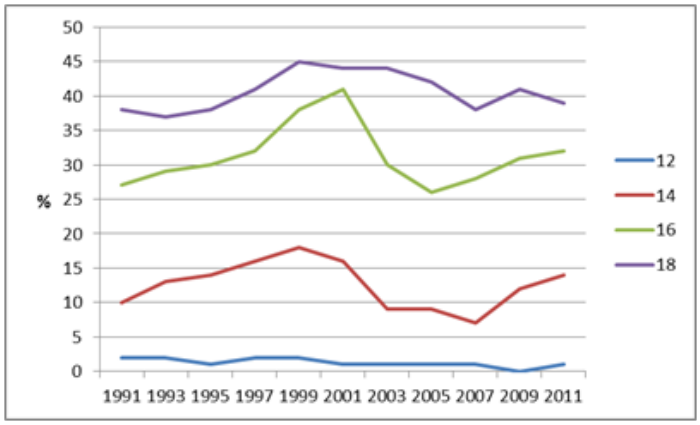


Figure 4. Snus experimenting among Finnish adolescent boys

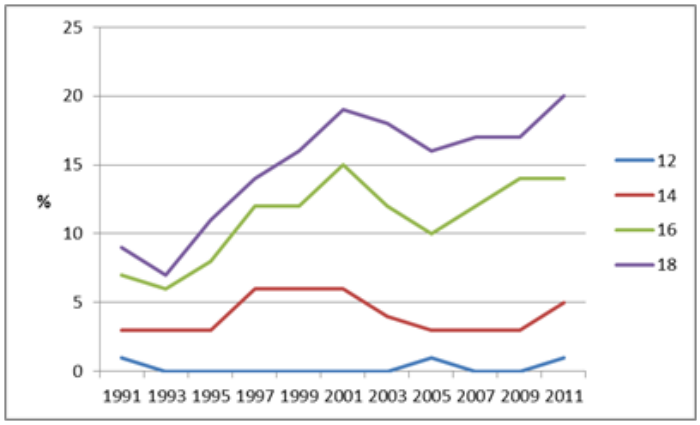


Figure 5. Snus experimenting among Finnish adolescent girls

citizens from exposure to tobacco smoke in workplaces and public places. Though this recommendation was tightening in terms of smoking, it might have resulted in bigger snus demand and consumption as oral tobacco might be used as a substitute to smoking in workplaces and public places.

Figures 2 and 3 show that both the EU legislation and the Swedish legislation on snus have strongly tightened between the years 1992 and 2012. Analysis behind the Figures 2 and 3 is presented in detail in Appendices 1 and 2. As the regulation has tightened, the regulatory legitimacy of snus industry has decreased during the research period. In conclusion, the regulatory legitimacy does not explain the entries and exits in snus industry: Snus has become legally less acceptable, meaning that regulatory legitimacy has decreased. However, the number of firms has increased.

4.3 Normative legitimacy

Figures 4 and 5 illustrate the experimenting rates of snus among Finnish adolescent boys and girls, divided in age groups. The experimenting rates of boys do not show a clear increasing or declining trend. However, snus experiments among 16 and 18-year-old girls have become more popular. In 1991, 7% of 16-year-old girls and 9% of 18-year-

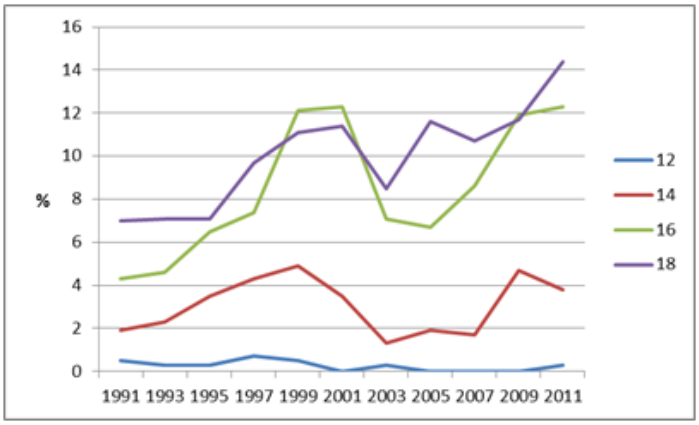


Figure 6. Daily or occasional snus users among Finnish adolescent boys

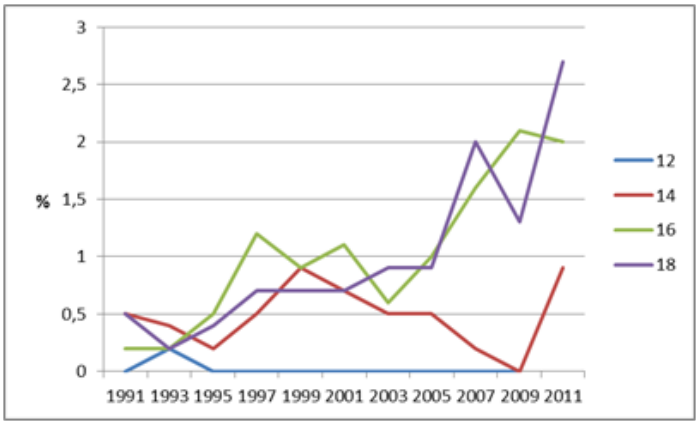


Figure 7. Daily or occasional snus users among Finnish adolescent girls

old girls reported that they have tried snus. In 2011, the figures were 14% and 20%, respectively.

Figure 6 shows the share of daily or occasional snus users among Finnish adolescent boys. An upward trend is clear among 16 and 18-year-old boys. In 20 years, the share of snus users has risen from 4.3% to 12.3% among 16-year-old boys and from 7.0% to 14.4% among 18-year-old boys. Despite the relatively common experimenting, extremely few Finnish girls report that they use snus daily or occasionally (see Figure 7). Nevertheless, the trend is upwards in this respect.

Figures 8 and 9 illustrate the snus habits of Swedish 9th-grade boys and girls during 1991–1997. A slight upward trend is visible in the share of students who have never tried snus, and a slight downward trend can be seen in the share of students who have tried snus. However, no major changes in the attitudes towards snus are visible and no upward or downward trend in regular snus use can be seen.

Figures 10 and 11 illustrate the snus habits of Swedish 9th-grade boys and girls in 1997–2011. 2001 seems to be a turning point in which snus use among Swedish 9th-grade boys starts declining. A significant change takes place in the snus habits of adolescents during 2001-2011: In 2001, 27% of boys report that they use snus. In 2011, the same figure

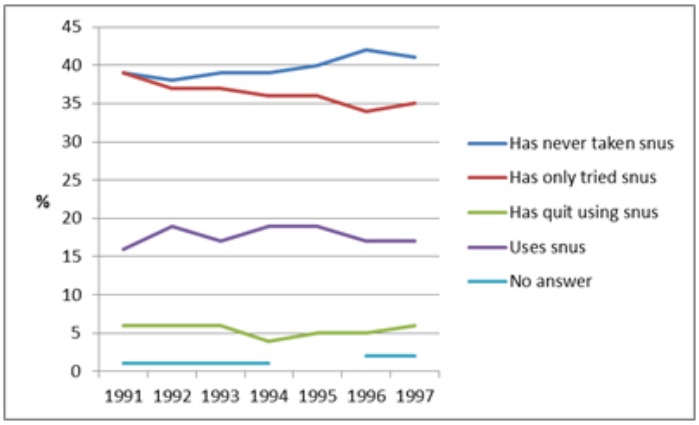


Figure 8. Snus habits of 9th grade boys in Sweden 1991–1997

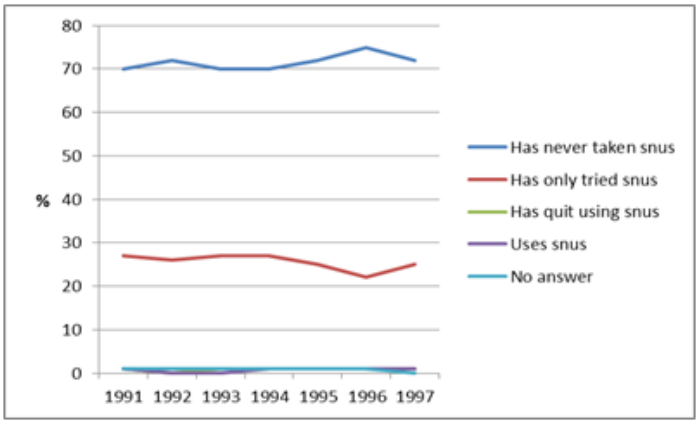


Figure 9. Snus habits of 9th grade girls in Sweden 1991–1997

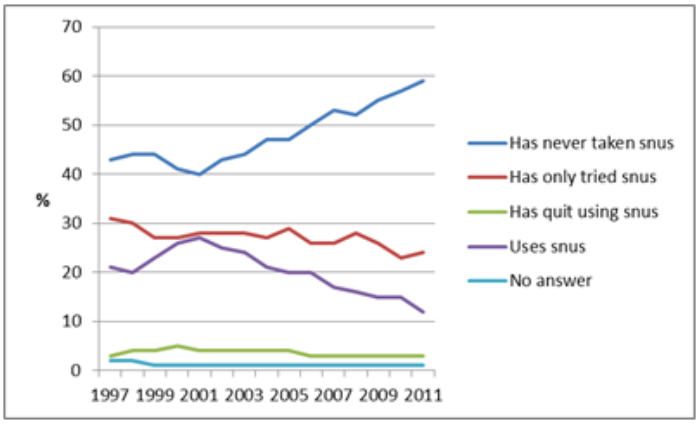


Figure 10. Snus habits of 9th grade boys in Sweden 1997-2011

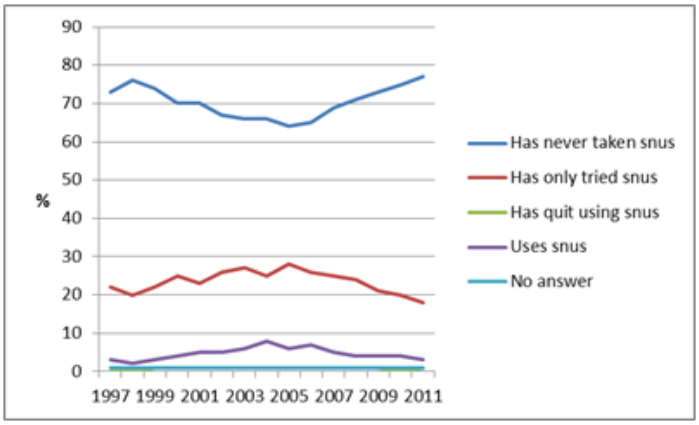


Figure 11. Snus habits of 9th grade girls in Sweden 1997–2011

is only 12%. Within the same time span, the share of boys who have never taken snus has grown from 40% in 2001 to 59% in 2011.

Use of snus among Swedish 9th-grade girls has not declined as clearly as among the boys of the same age (see Figure 11). Still, a turning point is visible in snus habits of girls too: From 2005 until 2011, the share of snus users has declined quite steadily from 6% to 3%, the share of snus experimenters has declined from 28% to 18%, and the share of girls who have never taken snus has increased from 64% to 77%.

It seems that the attitudes of Swedish adolescents towards snus have hardened in the recent years: Acceptance of snus has declined slightly already in the 1990s, and more heavily in the 2000s. Snus habits and experiments have become less and less normative among Swedish adolescents. In Finland, the attitudes towards snus have become more positive during the past 20 years. However, as Finland constitutes a much smaller market for snus than Sweden, we do not see that a change in the Finnish attitudes alone is enough to signal increasing legitimacy of the industry, especially when the Swedish attitudes behave reversely. Therefore, we conclude that the entry and exit rates cannot be explained with normative legitimation.

5. Discussion

Our study suggests that neither regulatory legitimacy nor normative legitimacy explains the late entries of the snus industry. Both regulatory and normative legitimacy showed decreasing trends while entry rates where increasing. Cognitive legitimacy was left out of the study. However, previous studies propose that cognitive legitimacy does not play a major role in mature industries (Aldrich & Fiol, 1994; Johnson et al., 2006). Therefore, it seems that explanation on entries and exits should be searched outside of the scope of legitimacy.

While conducting our study we found hints that late entries could be better explained through resource partitioning theory. The resource partitioning model claims that the rise of late-stage specialist segments is resulting from the consolidation of large generalists (Péli & Nooteboom, 1999).

The theory suggests that especially in an industry in which economies of scale give a competitive advantage, the competition between large and mid-size generalists is most intense in most abundant resource areas, referred as a market center. Larger generalist will eventually out-compete smaller ones and occupy their resources. The winner organizations adjust their offers to the mainstream needs at the center. However, winner's journey towards the market center leaves some customers unsatisfied at the edges. Small specialist organizations appear in these market pockets to satisfy the customers with special needs. (Carroll & Swaminathan, 2000; Péli & Nooteboom, 1999)

Swedish Match, a snus company headquartered in Sweden, has a 75% market share in the Swedish snus market (Kauhanen, 2012). This is a result of the state monopoly which was dissolved in 1967. The tobacco monopoly became Svenska Tobak AB, and later on the Swedish Match. Due to the high concentration of the industry, the rest of the companies have to be relatively small. For the future research, it could be interesting to study the structure of snus industry in more detail to find out whether the late-entry companies meet the description of a specialist and whether the snus industry represents a case of resource partitioning.

Another explanation for the late entries might lie in the regulation. We recorded several changes in the tobacco legislation, and it is possible that some of these changes have made entering the industry easier for small firms. However, we find this very unlikely because the new legislation has mainly restricted product diversity and thereby the opportunities to serve niche segments.

Furthermore, the support of Swedish government might have affected the future prospectives of the industry. In 1994, Swedish snus producers felt attacked by the EU's extremely tightening regulation that forbade sales of snus in the EU countries. This might have been an end for the industry especially since it was probable that Sweden would join the EU in the near future. Sweden's requirement for the special opt-out showed support to the snus industry. Therefore, the industry might have become more appealing also to new producers.

Our study had some limitations that need to be overcome by future studies. First, entry and exit data of the industry can be biased. As presented in the results part, according to our dataset the entry numbers have been rising during the course of time and all of the exits were from the years 2002–2012. This might, however, reflect a fallacy in our dataset. Orbis has a better coverage on firms from the last ten years, and does not necessarily provide comprehensive data from the first ten years. Therefore, for example, firms that have made an exit before 2002 might not appear in our searches because either they are not in the database or the data on them is less detailed.

Second, data on normative legitimacy was somewhat limited. Since snus is also widely used in Norway, investigating use habits in Norway would have made our findings of the changes in the social acceptance of snus more comprehensive. However, we find that this limitation did not have major impact on the results since Sweden and Finland, countries examined in our study, cover most of the snus market. We acknowledge that there are other possible sources to look for

hints of changing normative legitimacy. Snus is widely used among professional athletes, especially ice hockey players. How openly they use snus in the public should reflect the public opinion about and people's attitudes towards snus. This is one possible avenue for further inquiry about the normative legitimacy of snus industry. Another interesting question that our study arouses is the relationship between regulatory and normative legitimacies and whether one of them has an effect on the other.

Despite the limitations, we find that our study has significance for researchers and policy makers. First of all, our study introduces a potential industry for future studies. Snus industry has not attracted attention among industry evolution research although we find it highly interesting due to its long history and particular characteristics (e.g. geographical concentration, a history of monopoly and tight regulation). As mentioned before, our study also suggests a possible approach for future studies.

For policy makers the study has unfortunate findings. Although, EU has tightened the regulation of the snus industry substantially since 1992, new companies have still entered the market even in the latest years. The current regulatory actions haven't succeeded to restrict market entry.

6. Conclusion

Our study examined how the entry and exit rates of the snus industry have evolved over the years 1992–2012 and whether this evolution can be explained through sociopolitical legitimacy. Sociopolitical legitimacy was divided in regulatory and normative legitimacy. Our dataset of entries and exits, collected from Orbis database, showed that there have been entries throughout the time period. Normative legitimacy, measured by attitudes of adolescents in Sweden and Finland, gave somewhat ambiguous signals but overall, showed a declining trend. Furthermore, the legislation and regulation of EU and Sweden was showed to increase thus resulting in lowering regulatory legitimacy. The results of our study suggest that there is no clear relation between sociopolitical legitimacy and the entry and exit rates in the snus industry.

References

Aldrich, H., & Fiol, C. (1994). Fools rush in? The institutional context of industry creation. *Academy of management review*, *19*(4), 645–670.

Allabolag.se (2013) allabolag.se [Online]. Available at: http://www.allabolag.se/ (Accessed: 26 March 2013).

The Brønnøysund Register Centre (2013) Brønnøysundregistrene [Online]. Available at http://www.brreg.no (Accessed: 1 April 2013).

Carroll, G. R., & Swaminathan, A. (2000). Why the microbrewery movement? Organizational dynamics of resource partitioning in the U . S . Brewing Industry. *American journal of sociology 106*(3), 715–762.

Hannan, M. (1986). Competitive and institutional processes in organizational ecology. *Tech. Rep* (pp. 86–13). Ithaca, NY.

Hannan, M., & Carroll, G. (1992). *Dynamics of organizational populations: Density, legitimation, and competition. Dynamics of organizational populations: Density, legitimation, and competition.* New York: Oxford University Press.

Hannan, M., & Freeman, J. (1977). The population ecology of organizations. *American journal of sociology*, *82*(5), 929–964.

Hannan, M., & Freeman, J. (1986). Where do organizational forms come from? *Sociological forum*, *1*, 50–72.

Haydon, P. (2012, Oct 29) "In Sweden, smokers have another option – Snus". *Guardian.co.uk* [Online], Available from: http://www.guardian.co.uk/commentisfree/2012/oct/29/sweden-smokers-option-snus [Accessed on February 25, 2013]

Henriksson, C., Leifman, H. (2011). Skolelevers drogvanor 2011 (Drug use of students 2011). Centralförbundet för alkohol- och narkotikaupplysning, Sweden.

Johnson, C., Dowd, T. J., & Ridgeway, C. L. (2006). Legitimacy as a Social Process. *Annual Review of Sociology, 32*(1), 53–78. doi:10.1146/annurev.soc.32.061604.123101

Kauhanen, A.-L. (2012). Ruotsi ja EU ajautuivat ilmiriitaan nuuskasta (Sweden and EU fell into open quarrel about snus). *Hs.fi [Online].* Available from: http://www.hs.fi/ulkomaat/Ruotsi+ja+EU+ajautuivat+ilmiriitaan+nuuskasta/a1355374944254 [Accessed on February 25, 2013]

Meyer, J., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American journal of sociology*, *83*(2), 340–363.

Orbis, (2013) Orbis. Bureau van Dijk. [Online]. Available from: https://orbis2.bvdep.com/ [Accessed on April 1, 2013]

Péli, G., & Nooteboom, B. (1999). Market Partitioning and the Geometry of the Resource Space. *American Journal of Sociology*, *104*(4).

Raisamo, R., Pere, L., Lindfors, P., Tiirikainen M., Rimpelä, A. (2011). Nuorten terveystapatutkimus 2011: Nuorten tupakkatuotteiden ja päihteiden käyttö 1977-2011. Sosiaali- ja terveysministeriö, Helsinki, Finland.

Scott, W. R. (1995). *Institutions and organizations. IEEE Power Engineering Review.* Thousand Oaks, CA: Sage.

Snus in the Nordic Countries (n.d.) European Smokeless Tobacco Council. Available from: http://www.estoc.org/about-smokeless-tobacco/snus-in-the-nordic-countries [Accessed on April 8, 2013]

Sweden. Tobakslag (1993:581). Sveriges Riksdag. Available from: http://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Tobakslag-1993581_sfs-1993-581/ [Accessed on March 11, 2013]

Tiessen, J., Hunt, P., Celia, C., Fazekas, M., De Vries, H., Staetsky, L. Diepeveen, S.

Rabinovich, L. Ridsdale, H. & Ling, T. (2010). Assessing the Impacts of Revising the Tobacco Products Directive. Available from: http://ec.europa.eu/health/tobacco/docs/tobacco_ia_rand_en.pdf [Accessed on March 11, 2013]

Tobacco, Key Documents, Legislation & Policy. (n.d.) Available from: http://ec.europa.eu/health/tobacco/key_documents/index_en.htm#anchor0 [Accessed on March 25, 2013]

Tobacco products: towards bigger health warnings and ban of strong flavourings. (2012, Dec 19) Available from: http://europa.eu/rapid/press-release_IP-12-1391_en.htm [Accessed on February 25, 2013]

Tobaksvanor tidsserier och regionala resultat tom 2011, Available from: http://www.fhi.se/Documents/Statistik-uppfoljning/Folkhalsoenkaten/Resultat%202011/LV-tobak-tidsserier-o-reg%202011.xls [Accessed on March 24, 2013]

World Health Organization (2007). "The European Tobacco Control Report 2007". Available from: http://www.euro.who.int/__data/assets/pdf_file/0005/68117/E89842.pdf [Accessed on April 8, 2013]

Appendix 1. EU's regulatory acts in the field of tobacco product control 1992–2012

Year	EU's regulatory act (linked to tobacco)	Legal basis	Explanation	Direct effect on snus	Total effect
1992	Council Directive 92/41/EE	Directive	Ban on supply of tobacco for oral use in the EU	Extremely tightening	6
	Council Directive 92/85/EEC	Directive	Introduction of measures to improve safety at work of pregnant women or women just given birth	Neutral	0
	Council Regulation (EEC) No 2075/92	Regulation	Regulation on the organization of raw tobacco market	Tightening	4
1993	-	-	-	-	0
1994	-	-	-	-	0
1995	Article 151 of the Act of Accession of Austria, Finland and Sweden	(Opt-out) Regulation	Sweden joined the EU and negotiated an opt-out from the ban on oral tobacco. The opt-out allowed Swedish oral tobacco companies to continue their business within the country borders.	Loosening	-4
1996	-	-	-	-	0
1997	Directive 97/36/EC	Directive	Regulation on television broadcasting activities. According to Article 13, all forms of television advertising and teleshopping for cigarettes and other tobacco products were prohibited. In addition, tobacco companies were prohibited to sponsor television programs in Article 17.	Tightening	3
1998	-	-	-	-	0
1999	-	-	-	-	0
2000	-	-	-	-	0
2001	Directive 2001/37/EC	Directive	So called Tobacco Products Directive. The directive regulated the composition and labeling of tobacco products.	Tightening	3
2002	-	-	-	-	0

2003	Directive 2003/33/EC	Directive	So called Tobacco Advertising Directive banned cross-border advertising of tobacco products in printed media, radio and on-line services.	Tightening	3
	Council Recommendation 2003/54/EC	Recommendation	Initiatives to improve tobacco control.	Tightening	1
	Commission Decision 2003/641/EC	Decision	Decision on the health warnings in tobacco packages.	Neutral	0
2004	European Court of Justice Decision	Decicison	Council Dircetive 92/41/EE was uphold by the European court of justice. The snus manufacturers tried to challenge the EU ban on oral tobacco but the European court of justice ruled against the snus manufacturers. This was clearly a tightening message to tobacco producers.	Tightening	2
	Council Decision 2004/513/EC	Decision	Decision concerning the conclusion of the WHO Framework Convention on Tobacco Control.	Neutral	0
2005	-	-	-	-	0
2006	-	-	-	-	0
2007	Directive 2007/65/EC	Directive	So called Audiovisual Media Services Directive extended the Tobacco Advertising Directive to all sorts of audiovisual communications.	Tightening	0
2008	-	-	-	-	0
2009	Council Recommendation 2009/C 296/02	Recommendation	According to the recommendation, the member states should adopt laws to protect citizens from exposure to tobacco smoke in public places.	Neutral	0
2010	Directive 2010/12/EU	Directive	The directive aims at increasing the taxation levels of tobacco in the EU and in addition it aims to contribute to reduce tobacco consumption.	Tightening	3
2011	-	-	-	-	0

2012	Proposal for the Tobacco Products Directive	Recommendation	The European Commission announced that in the next health directive, the regulation on tobacco industry will be tightened with requirement that all tobacco products include 85% tobacco at minimum. In addition, the European Comission aims to ban flavours in tobacco products.	Extremely tightening	2
	Commission Directive 2012/9/EU	Directive	A revision to the additional warning texts of smoking products in Annex I of Directive 2001/37/EC	Neutral	0

Appendix 2. The regulatory acts by the Swedish parliament concerning snus 1992–2012

Year	Sweden's regulatory act (linked to snus)	Legal basis	Explanation	Direct effect on snus	Total effect
1991	-	-	-	-	0
1992	-	-	-	-	0
1993	-	-	-	-	0
1994	Förordning (1994:1266) om förbud mot utförsel av snus	Regulation	Snus may not be exported to another country within the European Union. The ban does not apply to goods carried by a traveler for himself and intended for their personal use or as a gift for personal use.	Extremely tightening	8
1995	Förordning (1995:1150) om fastställande av omräknade belopp för tobaksskatt för år 1996	Regulation	Tax on snuff: 77 kronor per kilogram	Tightening	4
1995	Förordning (1994:1403) om fastställande av omräknade belopp för tobaksskatt för år 1995	Regulation	Tax on snuff: 75 kronor per kilogram	Tightening	4
1996	-	-	-	-	0
1997	-	-	-	-	0
1998	-	-	-	-	0
1999	-	-	-	-	0
2000	-	-	-	-	0

2001	-	-	-	-	0
2002	-	-	-	-	0
2003	-	-	-	-	0
2004	-	-	-	-	0
2005	-	-	-	-	0
2006	Förordning (2006:1166) om avgifter för offentlig kontroll av livsmedel och vissa jordbruksprodukter	Regulation	Charge for approval and registration of a snus manufacturing plant, Charge for additional public control	Tightening	4
2007	-	-	-	-	0
2008	-	-	-	-	0
2009	-	-	-	-	0
2010	-				0
2011	Förordning (2011:1125) om fastställande av omräknade belopp för tobaksskatt för år 2012	Regulation	tax on snuff: 345 kronor per kilogram	Extremely tightening	8
2012	Förordning (2012:699) om fastställande av omräknade belopp för tobaksskatt för år 2013	Regulation	tax on snuff: 386 kronor per kilogram	Tightening	4

Crowdfunding and the video-games industry

Romain Guillaud, Riku Hänninen, Pauline Mariot, Eva Perret

ABSTRACT

In this paper we will discuss about the effects of crowdfunding in the video games industry. Indeed the study of the video games industry has conducted us to wonder about a new phenomenon the crowdfunding, its consequences, and its origins. We wanted to analyze the creation of this new industry and compare it with the traditional video games industry. Our study examined three hypotheses related to the phenomenon, and found that the age of the phenomenon limits some of the conclusions that could be made without relying on speculation. What was clear, however, was that crowdfunding as a phenomenon has been picking up speed, and has at least tentatively revitalized certain portions of the video game industry. It seems to have contributed towards new genres and ideas, while simultaneously allowing for developers to fund projects they have sought to work on for years, but found traditional funding lacking. The variety and weight of certain genres and projects suggests a failure in the traditional industry to provide certain types of games to the consumers' satisfaction. This was demonstrated by marked enthusiasm towards funding certain types of projects highlighted in this study. This study also identified two major factors in determining the success of a project, the legacy and the reputation of the project, which played significant parts in determining a project's legitimacy and hence attractiveness to funders. As a direct result, a project's success was reliant on this legitimacy to be successfully funded and to be considered a success. A VSR-framework explanation for the selection mechanics for Kickstarter was also examined, but could not be wholly confirmed due to the time required for complete retention results to be perceived, and the resulting lack of data.

1. Introduction

Crowdfunding is a new phenomenon started around two years ago in several industries as music and video games. The principle is simple: someone proposes his idea and asks for common people and potential customers who believe in the project to invest the money they can (it could be a very small amount). We have chosen to focus on the video games industry because this concept is pregnant in this industry; there are a lot of ideas and projects. Indeed all developers can individually think at new game but need funds to develop it. With sites like Kickstarter or Indiegogo, the links between the investors and the projects are facilitated. The particular type of crowdfunding when talking about videogames has essentially been standardized. The usual approach bears close resemblance to pre-ordering, in that customers preemptively pay for the game and in turn receive various perks in the form of merchandise and the game in question at a discounted price. This phenomenon has changed a lot of things in the video games industry. Indeed even if the hardware is not concerned at the first sight, the crowdfunding has effects on it (Handrahan, 2012) because the games developed thanks to it are realized for PC (less expensive and easiest way to reach everyone). Consequently there are more games for PC than for the consoles, and it may influence the customers in his choice to buy or not a console. Moreover the crowdfunding changes the link with the customers. The customers are implicated in the development of the games they want to buy and play later, it is like a pre-order and a long-term investment (Kain, 2012). This fact influences also the genres developed in the video games industry because there is no brake from the publishers. However the tastes of the customers could be not so innovative thus we wonder if the crowdfunding permits to create new gender and to boost the innovations or in the contrary if nothing changes. Nevertheless we can see that there is a ripple effect (Kain, 2012) in a sense that when a gender succeeds to have to fund to be developed, all lot of games in the same gender will be proposed in the two sites. We can also observe that as the customers are involved in the development the software piracy (Kain, 2012) declines.

In this paper we want to compare the traditional video games industry and this new phenomenon which is the crowdfunding in it. Indeed we want to understand how the crowdfunding has emerged and what changes in the industry it makes. This study is limited to the year 2012 for examining the various video game Kickstarter projects. Kickstarter was chosen specifically due to being the most popular platform for crowdfunding video games, and due to the availability of data on their projects. The study is limited to 2012 for the reason that 2013 is still in progress, and prior to 2012 the system had not seen growth as significant as in that year. 2012

saw a significant rise in the number of Kickstarter game projects and also saw several of the largest game projects in its history. As such, 2012 was chosen in order to keep the amount of data to be analyzed within reasonable bounds, and to give a recent dataset to analyze for indications of future development. We have chosen for our analysis the organizational ecology as framework for several reasons. According to the ILC theory we can see that the industry is in the growth stage and we can observe an isomorphism in the innovation; so it implicates that all the games converge to the same genres with a lot of similarities. However the crowdfunding is a new phenomenon which influences the all industry thus the organizational theory is a good way to observe not only the stage of the industry but more how externs forces cause changes in an industry. We will use in particular the concept of niches, legitimacy. Moreover the organizational ecology is a good way to realize a comparison between populations.

First we want to know if the crowdfunding has emerged thanks a weakness in the traditional video games industry. Second we will analyze if the crowdfunding has permit to revitalize the traditional industry trough niches. Third we will look at the legitimacy of the projects involved in the crowdfunding.

2. Theoretical background

The organizational ecology theory has been developed by researchers such as Baum & Shipilov and Mattson & Järvinen to give tools for analyzing organizations and their strategic management.

This approach highlights the importance of *external selection processes*, i.e. of contextual and environmental causes (social, economic and politic conditions) which can affect the density of organizations in an industry and also their *diversity* through time. Indeed, organizations are dependent of their endogenous and exogenous environment: that is why they can be studied through three levels: an intra-organizational level (internal organizational contexts, individuals' actions); a population level (a set of organizations having similar activities and needs of resources); and a broader community-level (involving the relationships between populations from different activities). These levels lay emphasis on interactions and dynamics of organizations in their population and in their community, which are major themes of the Organizational Ecology theory. In fact, these dynamics explain the variation of the density and the *diversity* (contrary to the ILC approach) of the given population.

Then, a second major assumption about Organizational Ecology theory is the *structural inertia* of organizations. Indeed, because of internal causes (conservative forces of history and tradition, investments, constraints in processing and transferring information...), external causes (external information constraints, legal and fiscal barriers to entry and exit, contracts and commitments...), organizations are slow to adapt themselves to the environmental changes. These are especially the core features which are hard to change because organizations are afraid of the liability of newness. Besides, the

Organizational Ecology theory explains that this tendency of inertia is a function of organizations' age and size: indeed, large and old organizations have time and mean to buffer themselves from failure, formalizing standardized routines, institutional leadership and stable relationships with other actors; thus creating reproducible structures and inertia. Then, it seems harder to adapt themselves and change core features to face environmental changes. The tendency to inertia appears also after an organizational change. This is called a *repetitive momentum*. Organizations become more experienced each time they change; if the change is successful, it will involve a repetition of the change process, attracting organizations to inertia again. Finally, the structural inertia is part of the VSR-framework at the organizational population level. Indeed, variation is introduced by new organizations in the population and the selection results from the fit between the organizations and their environment (implying that the selection criteria are embedded in the environment). The retention appears through external pressure and the internal inertia of organizations (reproducibility and repetitive momentum).

The *niche-width theory* is another very important assumption for the Organizational Ecology theory, implying that the diversity of the population creates a co-presence of specialist and generalist organizations in a same population. Generally, specialists occupy narrow niches while generalists occupy broad niches. Indeed, niches are dependencies of an organization on a given set of environmental resources; they consist of multiple resource dimensions depending on their environment. So, the environment favors specialists or generalists according to the variability of the environment (the importance of environmental change) and the grain of the environmental changes (the frequency of environmental fluctuations). Specialists are favored in every case except when the changes are coarse-grained and the environment has a high variability, which favors the generalists. The co-living of specialists and generalists in a same population, having more or less *a niche overlap* also implies that they have to share the resource space. This repartition of resources and assets between them is called the *resource partitioning*.

Finally, the Organizational Ecology theory analyzes the strategic management of organizations, affirming that they need a kind of agility and awareness, especially through an *experiential learning* (operational and competitive learning), a balance between the exploitation of old routines and the exploration of new ones. This allows organizations to predict in advance the chances of success of a change and hence to be more responsive regarding the environmental changes. Most of all, the Organizational Ecology theory lays emphasis on the organizations' legitimacy to increase their survival rates. Organizations are embedded in their environment i.e. they are influenced by institutional actors, public relations, partners, stakeholders, customers... They can really increase the legitimacy of the organization, so it has to manage carefully its relationships with these external actors.

3. Theoretical framework and our research

Considering that assumptions about the Organizational Ecology, we could use them as the lens for our investigation for different reasons:

Firstly, contrary to the ILC theory that would be limited, the analysis of the diversity of the population, i.e. its dynamics with its environment will be useful. Indeed, external factors could highlight the emergence of the crowdfunding such as a renewal of enthusiasm of customers, a desire of old-school and nostalgic game projects; the inertia and isomorphism of the traditional video-game industry that trigger new customer needs; Besides, the customer place has changed, he is more than a advice-people for developers through its feedback, he becomes an investor and so has an increasing place in the environment.

Relating to the Organizational Ecology theory, crowdfunding fits very much into the niche-width theory. Crowdfunding acts as a unifying funding system for a number of niches, potentially representing a nontrivial segment of the industry in the future. It will be interesting to compare crowdfunding projects with the traditional video-games and define the resource partitioning between generalists – the traditional video-games actors – and the specialists – the crowdfunding video-games actors – especially about genres.

The VSR-framework is also an interesting aspect of the Organizational Ecology to exploit: how it can explain the emergence of the new phenomenon, and its apparent structure as a consequence of the traditional game industry. The variation is clearly the development of the crowdfunding projects and actors; the selection is the credibility of the projects (especially through the presentation pitch and the legitimacy of developers) and the ability to respond and deliver what the developer has promised to the customer. Then, the retention is the apparition of the ripple effect through the emergence and retention of similar successful projects.

Finally, and in link with the previous points, the concept of legitimacy developed by the Organizational Ecology will be interesting to exploit to analyze the emergence of the crowdfunding phenomenon (with the pre-entry experience teams).

4. Research question and hypotheses

First hypothesis: *there is a failure to provide for existing demand in the traditional video games industry which permits the emergence of the crowdfunded games.*

By failure, we mean a failure in the way of satisfying market's expectations. Indeed we suppose that because its structure and the pressure from the publishers there are a lot of constraints in the traditional industry which limit the innovativeness and the creativity in the games' development and stop the launch of risky projects and thus the lateral growth of the industry. Consequently crowdfunding proposes another structure which linked directly

the customers and the developers so as to remedy this situation. This hypothesis can be confirmed by observing the games offered by the industry, and their makeup, and comparing that to the projects funded for Kickstarter. It stands to reason that projects for which demand exists, which is not satisfied by the industry, would receive greater attention at crowdfunding.

Second hypothesis: *crowdfunding revitalizes the video games industry through the support for extant and new niches.*

Thanks to the crowdfunding games there are more niches and genres which are produced thanks to the customers investment and which have not been published in the traditional way. We could divide these genres into two categories: old and existing genres (garnering support from a customer's nostalgia) and innovative genres (emerging from a research of creativity). The resource partitioning tool will be interesting to use to analyze this hypothesis in order to compare the launched genres and their success in the crowdfunding platform relative to the genres of the traditional industry. The auto-selection in the crowdfunding enables the continuity and the development of this concept: a developer who fails to produce what he has promised. A more complex hypothesis, it is difficult to say whether or not such revitalization will occur in long-term, and as such it will be limited to observable effects for the purposes of this study. Revitalization would mean for "extinct" genres experiencing a resurgence, and for new genres that are traditionally not funded to be funded through crowdfunding.

Third hypothesis: *the legitimacy of the crowdfunding projects increases their rates of success.*

By legitimacy we mean a pre-entry experience of developers in the video-games industry, a convincing project's presentation and a strong effort in keeping its promise to the customer. This legitimacy is clearly embedded in the VSR framework: as previously stated in the theoretical framework, the legitimacy is the main process of selection. In a short-term perspective, the convincing pitch is compulsory and then in a longer-term perspective, once the game has been funded, its ability of keeping its promise about quality and creativity (thanks to the expertise and experience of the developers) is essential to build the reputation of these specific games/genres; creating their retention.

5. Data and methods

As the phenomenon is very recent, and in lifecycle terms still in a very early phase, much of the information available has been preliminary and somewhat speculative in nature. Certain claims that can be made are not going to be possible to reference to existing studies due to the age of the phenomenon, and rely more on observable reactions of the customer base.

The data is composed of industry publications, technical publications with subjects from crowdfunding itself to various game projects – especially success stories - associated with it. These afforded us with industry opinions on the issue, some insight into how various large players in the industry

have reacted to the phenomenon, and some views into potential customer expectations and opinions on the issue. To sum up, it gave us an overview of the environment: reactions, expectations of the participating parties (customers, traditional publishers, developers using Kickstarter) and stakes about the emergence of crowdfunding, changing the ecosystem of the traditional video-games industry.

The most part of our data has been collected from crowdfunding sites – especially Kickstarter because this is the main and most exhaustive crowdfunding platform – to create a list of every video-game projects launched during the year 2012. After having created this list, we searched the genre and the success/failure of each game. On the other side, we obtained a list of every traditional published game thanks to Giant Bomb website and we found the genre for each of them. The focus was on PC games due to the simple fact that the vast majority of data available was for such projects. An alternative aspect to study would have been mobile games, but in order to shrink the data to a manageable load, they were excluded.

Such available data gave us insight on the differences between crowdfunding development process and traditional video game, according to their success and their genre. This allowed us assessing the main developed genres of games on the crowdfunding platform regarding the traditional industry and thus allowing us defining the resource partitioning in this industry. Besides, we could have an analysis of the different genres developed on the crowdfunding platform regarding their success and if they are innovative or previous extinct niche genres. These data have been used to create graphs and statistics.

The established publishers for analysis were decided based on the available choices in the Giant Bomb database, collated with the list of active publishers (Wikipedia, 2013). As only publishers that are currently active can release games, any inactive publishers were excluded from the comparison. Also, only the independent publishers were selected, as any publishers that are owned by larger ones would only introduce duplicate numbers towards any tally that would be made for published games.

Table 1. Established publishers of PC games currently in business that have published games in 2012 (Wikipedia, 2013) (Giant Bomb, 2013)

1C Company	Legacy Interactive
505 Games	Marvelous AQL
Activision	Matrix Games
Anuman	Microsoft Game Studios
Big Fish Games	Namco Bandai
Capcom	Paradox Interactive
Codemasters	Southpeak Interactive
Deep Silver	Square Enix
Disney Interactive Studios	Stardock
Dtp Entertainment	Take-Two Interactive
Electronic Arts	Tecmo Koei
Funcom	Ubisoft
Her Interactive	WB Games
indiePub Entertainment	Webzen

6. Results

Having listed the publishers, any games published by them for PC in 2012 were counted, making use of the Giant Bomb database. It was chosen due to the established nature of Giant Bomb as an industry news/reviews website, and due to the usefulness of its search system for data gathering.

A total of 106 games could be found from the Giant Bomb database, which might not be entirely comprehensive, but should cover the majority of significant publishers. Naturally, many more publishers have published games, and many in the graph have published far more games than represented, but figure 1 only shows PC games published, which significantly limits the data set.

Next, the games were sorted by their relative genres. To keep the chart as neutral as possible, the games were assigned the genre cited for them in the database. If two or more genres were presented, the more obviously significant genre was given precedence. For example, a game that is both an MMO and a First Person Shooter, was listed as an MMO due to its central nature to the game's functionality.

Figure 2 demonstrates the spread of various published games of 2012 over a variety of genres. Some are more common than others, while a few are relatively niche genres that saw only few games published during 2012. The clear winners are MMO (Massively Multiplayer Online), FPS(First Person Shooter), Adventure, Racing, Action and Strategy. Here, Adventure does not refer

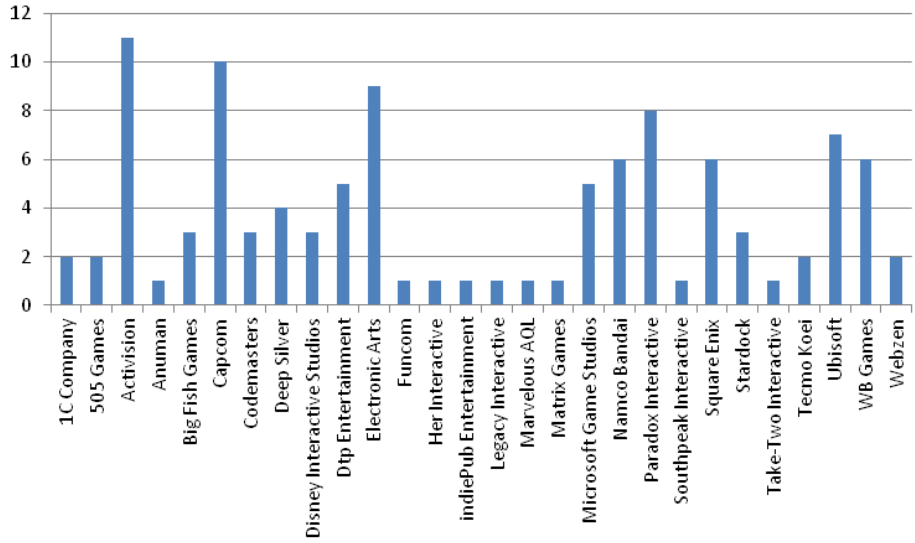


Figure 1. (Giant Bomb, 2013)

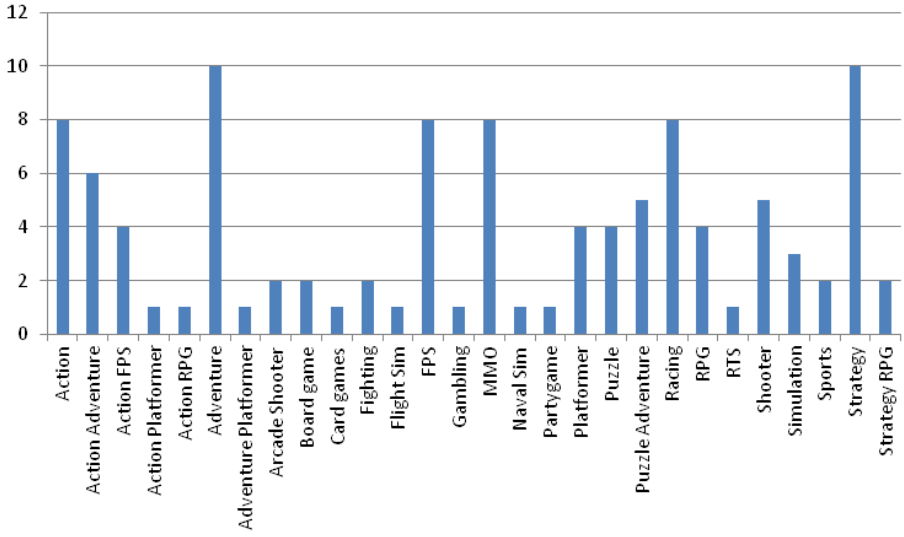


Figure 2. Spread of games published in 2012 over various genres (Giant Bomb, 2013)

only to the old-school Point-and-Click adventure genre, but is a more generic genre covering all sorts of adventure gaming. Action is fairly generic genre as well, and Strategy refers to any games of strategic nature that do not fit into certain very strictly defined genres, like Real Time Strategy games (RTS).

As such, only three clear, well-defined categories remain; Racing, FPS and MMO. These three have been fairly popular traditionally and/or in the recent years. Various sports games are also traditionally popular, but due to the greater focus in releasing them on consoles as opposed to PC often lead

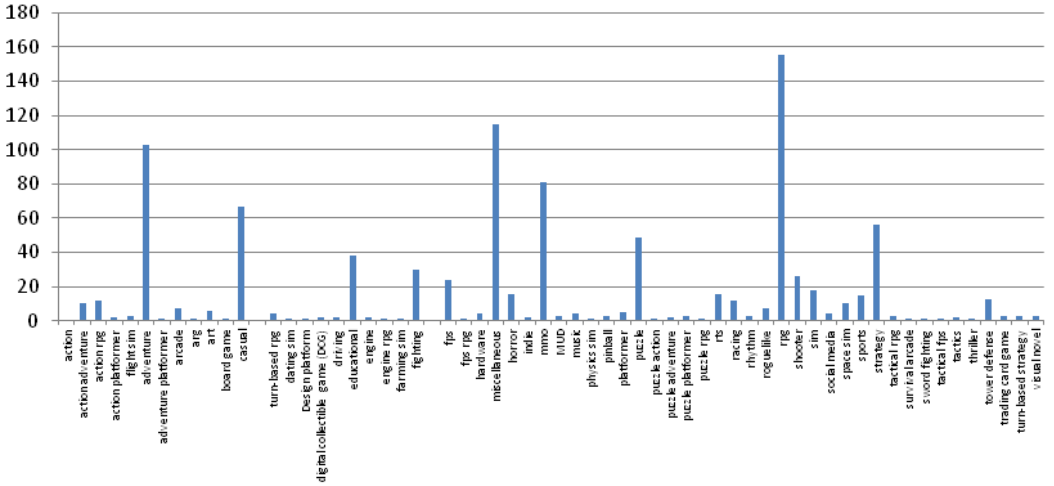


Figure 3. (Clark, 2013)

to delays for cross-platform releases, or limit the number available. Of particular note are the various niche genres represented, namely various simulation games and the odd gambling game. Strategy in this chart also includes various games that are of niche genres within strategy games, mostly released by Paradox Interactive and Matrix Games, focusing on Grand Strategy. As such, they are essentially specialist publishers, catering to specific genres, although they do occasionally release games in different genres as well.

By comparison, the number of Kickstarter projects in 2012 was massive. Filtering out everything except Gaming-related projects left still more than a thousand projects. The raw data was acquired from Kicktraq.com, a website that monitors Kickstarter projects, and records their performance over the funding. From this data, the required information could be gleaned. The chosen projects were examined and had genres assigned to them based on what the project page itself stated, or in the absence of a clear genre and no statement towards a genre from the project heads, the project was put in the 'Miscellaneous'-category. Any mobile games were also filtered from the data sample, as they would have detracted from the PC analysis.

Then, this graph shows the various Kickstarter game genres for proposed projects. As can be seen in Figure 3, many projects did not fit very well to a certain genre. The number of miscellaneous projects is the second highest peak, with only Role-playing games (RPGs) being more prevalent. The Figure 4 has a condensed version of this graph, showing all games with 'puzzle' in their names condensed under 'puzzle', and the same done for other genres as well. Any games not easily condensed are put into 'other'-category, including the miscellaneous games.

Figure 4 shows a more condensed representation of the various genres, comparing the various levels of Kickstarter projects to the published games for the same year. Obviously such

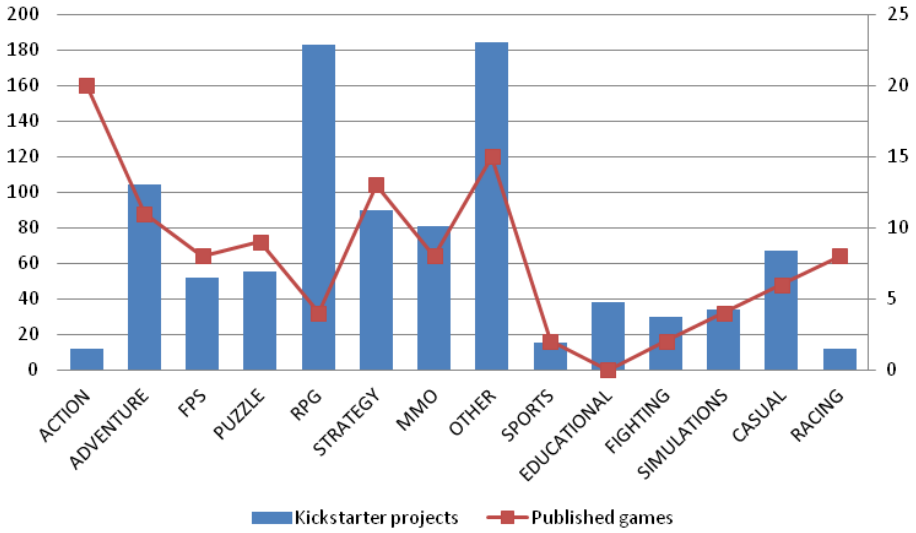


Figure 4. Condensed project genres

comparison is very rough in nature, as it required significant lumping together of various Kickstarter genres in order to have a comparable graph. It does however show some similarities and some differences between the publishing industry and the crowdfunding scene. The 'Other' category is more or less useless for this comparison, but in many cases the trend is somewhat similar. FPS and Puzzle games are apparently of somewhat similar representation within the market and the funding projects. Puzzle games were separated from the casual game category largely due to its specialization and ease of categorization. Certain obvious differences are the prevalence of educational games in the Kickstarter projects, and while they are occasionally published, it is very rarely due to the large publishers, and as such information on them was difficult to find. The comparable representation of various action titles seems higher in the market as opposed to the KS projects. This could be the reason for comparable lower representation in the projects, as the desire for such titles might already be well sated by the market. The comparable amount of adventure games is deceptive, as many of the adventure titles in KS are of the "Point and Click" variety, or otherwise a traditional adventure game that has been largely absent from the markets for years (Bergen, 2012).

The current prevalence of MMO games of various genres in both KS and industry projects is a relatively recent cultural development, started by the success of World of Warcraft and the ensuing rush by many companies to the nascent market. Perhaps the single largest difference between KS projects and the market offering is the prevalence of various RPGs.

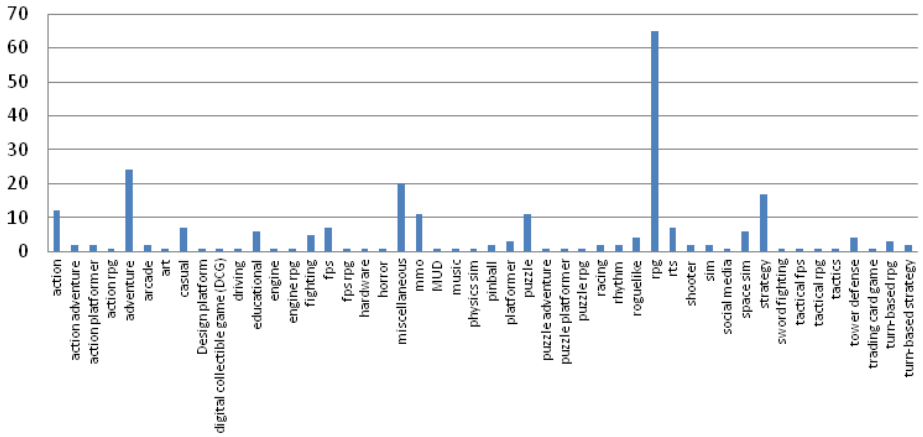


Figure 5. (Clark, 2013)

Figure 5 shows the successful projects from Kickstarter, and this has greatly pruned both the numbers and the various genres represented in the projects. RPGs are the single most represented genre in successful projects, followed by adventure games. Both genres include many projects that seek to capture the spirit of older games in these genres.

Table 2. (Clark, 2013)

Percentage of projects successfully funded:	31.73%
Percentage of projects failed:	68.27%

To attempt to reach a better understanding of the possible mechanics behind success on Kickstarter, an effort was made to map the best 25 performing projects on Kickstarter in 2012. Table 3 shows the projects in question): As can be seen from Table 2, a large portion of the most successful projects are RPGs, or adventure games. Some strategy games and the odd niche game are successful as well, such as SolForge and Star Citizen. In order to compare these top performing projects, the following criteria were created to get a rough idea of the prevalence of various factors in the projects:

On a scale 0-3, from no relevance to heavy relevance, the factors of Reputation and Legacy were evaluated for each of the top 25 projects. Reputation stands for the Project Crew reputation and perceived competence. Prior experience with similar games is important here, or lacking that, obvious indications of competence(such as other game design background, clear relation to the IP in question, or ability to draw in professionals due to celebrity influence(i.e. big name)). With Legacy, the scale simply measures the degree to which the game in question seeks to evoke prior games for momentum towards its funding and its goals. 0 means a completely new game and concept that is not tied to existing titles. 1 means a minor tie, either in genre or name to a previous title. 2 means an obvious tie to a previous specific game series or a genre that is being "resurrected" or otherwise channelled for the project. 3 is reserved for spiritual sequels or direct sequels to

Table 3. Top 25 projects (Clark, 2013)

	Funding(USD)	Genre
Project Eternity	3986794	rpg
Double Fine Adventure	3334203	adventure
Wasteland 2	2933197	rpg
Homestuck adventureGame	2485336	adventure
Planetary Annihilation - A Next Generation RTS	2228344	rts
Star Citizen	2134039	space sim
Shadowrun Returns	1836447	rpg
Pathfinder Online: A Fantasy Sandbox MMO	1091194	mmo
Broken Sword - the Serpent's Curse Adventure	771560	adventure
The Banner Saga	723886	strategy
Castle Story	702501	strategy
Make Leisure Suit Larry come again!	655182	adventure
Carmageddon: Reincarnation	625143	driving
Tex Murphy - Project Fedora	598104	adventure
Yogventures!	567634	action adventure
Shadowrun Online	558838	turn-based rpg
Two Guys SpaceVenture - by the creators of Space Quest	539767	adventure
Grim Dawn	537515	action rpg
Project GODUS	526563	strategy
CLANG	526115	sword fighting
Jane Jensen's Pinkerton Road 2012-2013 CSG	435316	adventure
SolForge Digital Trading Card Game	429715	digital collectible game (DCG)
Hero-U: Rogue to Redemption	409150	turn-based rpg
Dead State: The Zombie Survival RPG	332635	turn-based rpg
Defense Grid 2	271711	tower defense

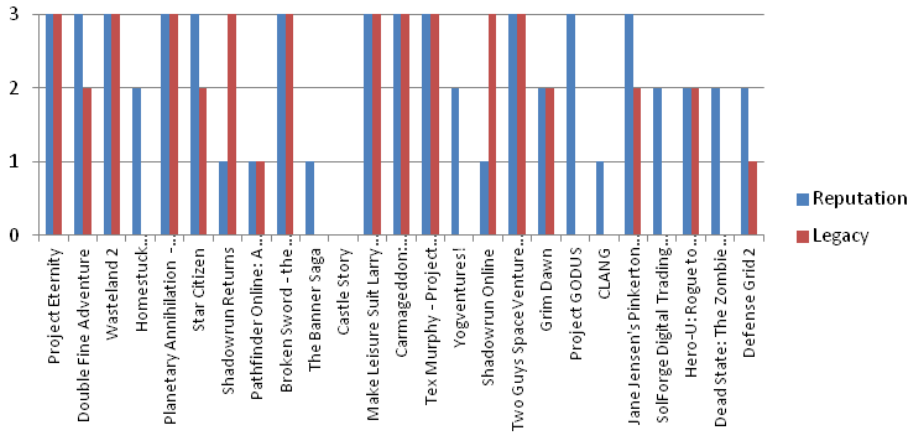


Figure 6. Reputation and legacy of top 25 projects

an existing game or game series, and is the most constrictive definition for the project.

Figure 6 shows the top 25 projects grade on these criteria. Naturally this sort of grading is approximate at best, and was done by noting down the project pages' use of various keywords, such as references to known developers involved in the project, referencing of existing titles, involvement of people and companies of importance, etc.

As can be seen from figure 6, most of the top 25 successful projects seem to have relied on either the reputation of the developers and the project leads, the legacy involved in the project, or both for their funding. Many projects in Table 2 were launched for projects in a certain genre, headed by people who developed many milestone titles in the same genre in their past, and often involve the new projects being spiritual, or even direct sequels to the titles they evoke. As such, it seems likely that the successful projects leverage nostalgia for their funding, but there is also significant indication that certain types of games are very much in demand, but have not been offered by the market for a number of years.

Some very successful projects have been more innovative, or otherwise break this mould. SolForge for example is digital version of a collectible card game spearheaded by people with experience in the industry for such games, seeking to expand into the digital game market. Castle Story is a smaller scale project that gained significant support due to its appealing style and interesting gameplay mechanic. The Banner Saga was an innovative spin to the tactical game genre, combining elements that have not been traditionally seen in similar games. Lastly, Clang is an extremely innovative game due to its aims and what it seeks to be. As such, it may have been funded in part due to its novelty, but at the same time it is a game that may have had a niche market waiting for it. Trying to find the exact reason for its success is difficult due to its relative uniqueness as a game, there simply are not other sword fighting simulators to compare it to.

Many Kickstarter projects follow similar extremes; they either seek to evoke a very defined type of game, or go more or less completely avant-garde in their representation.

7. Discussion

"In general, games with big, big budgets are risky because they have big, big budgets. They're not risky necessarily because the ideas are very new. That leads to a thing where, when you're making something smaller, the risk can't be the money. In some ways then the risk is that it's new and different. That's why you see a lot of new and risky things from indies and on the downloadable platforms and things like that." (Grayson, 2013).

In the recent years, digital distribution has seen to the rise of indie gaming as a scene, and crowdfunding has further increased the number of independent projects. As mentioned in the previous quote, larger budgets also bring greater financial risk, and that tends to make investors queasy. This may be the reason for continued investment in tried and true genres such as FPS, Racing and MMOs (as can be seen in Figure 5).

Regarding hypothesis 1, it could be said that the indication of genres supported by crowdfunding in comparison with the types of games published by the industry, certain types of games seem to certainly have far greater appeal to the customers than what is being satisfied by the industry. This seems especially prevalent in RPGs and many legacy projects, with people seeking sequels or spiritual sequels to many old games that stopped receiving support despite demand.

> *"Game creator David Braben was banking on nostalgia, it would seem, which isn't a wholly unreasonable thing to do when it comes to Kickstarter. Nostalgia rules the roost in crowdfunding land, and we're all hopelessly entranced by it."*
>
> (Kain, 2012).

Nostalgia is certainly a large factor in various Kickstarter projects, and seems to be a large motivator for people to invest in a project. Many of the largest projects in 2012 were essentially nostalgia projects, promising funders a tried and true game from developers that have experience in making them, and often ones that were involved with games that many funders looking for such projects appreciate. That there still exists demand for such games is indicative of further potential in such genres. It is impossible to quantify at this point why exactly several game genres petered out, but obviously the industry considered such games to be either risky investments, or deemed the potential returns to be less than they were willing to work for. Often there is also issue of prioritization as well, and many projects are discontinued or not started at all in order to free funds for larger projects. As projects grow in size, the publishers also get less and less receptive to risk-taking, as potential losses could be crippling.

It can be debated whether the current projects relying on nostalgia are actually good for innovation within the genres. It is possible that this first round for many games will be very similar to the games' forefathers, but the future games to follow would innovate on that foundation (Walker, 2012). It would also be somewhat disingenuous to expect massive leaps of innovation in addition to bringing back "extinct" genres of games, as similar innovations are more or less extremely rare in general.

It is certainly worth noting that since the technology available has changed, producing certain games is comparably less expensive, or certain things can be achieved easier, or in a more impressive fashion. The market has also changed, and the way games are sold has also shifted towards digital distribution. It is also apparent from the success of many "old" genres of games represented in successful Kickstarter projects that demand exists for these genres. It is possible that the niche markets from which this demand stems are the same ones that existed previously, but have not seen companies taking advantage of them in some time. It is also possible that due to the time involved, to a certain extent such markets are different from the heyday of the game and game types in question. This would mean that there are untapped niches that are not currently satisfied by the publishing industry. Some niches are very clearly the "nostalgia" niches, covering types of games that have not been around for a while, or have been represented in a significantly smaller numbers. Referring back to figure 5, RPGs of various types are an obvious project type that has garnered significant support in Kickstarter. Some other special projects that also benefit from the nostalgia represent less popular genres such as Space Simulations, which nonetheless have a very solid fanbase. This could explain the rapid success of Star Citizen, offering something that hasn't been around for a while.

The way Kickstarter seems to select for the projects is fairly simple. A project's initial success rests largely on several factors. There are the names involved in the design, and the attractiveness of the project itself. The single most important part seems to be the presentation of the project. All the top 25 successful projects had very well presented project pages, involving videos, graphics, explanations, often gameplay footage and art. Projects that would otherwise have seemed competent, but lacking these ingredients, could have trouble getting funded until the approach was change (Kain, 2012). People in general seem very reluctant at the idea of essentially pre-ordering a game if they cannot see anything about it. At a bare minimum a well presented project page with concept art and other material seems to be necessary.

The long-term selection process for Kickstarter projects is still something that will not be seen for a few years. In theory it should be very simple, however. If a project fails, the funders will not get their money back, and will thus be unlikely to fund anything by the same project crew in the future. This should have a relatively harsh cut-off for repeated attempts, but it is something that time will tell. The retention of those project launchers that succeed at project funding, and deliver what was promised is likely, as long as they keep coming up with project pitches that convince further funding.

The initial selection phase is very simply demonstrated by comparing the figures 3 and 5, for only less than 1/3rd of the projects get successfully funded. From the sample of projects (game projects for 2012, PC), the overwhelmingly shared factor for success was a good presentation. Practically no successful project had a lacking or a poor presentation. On the other hand, the majority of failed projects often had short presentations, obviously unprofessional presentations, or otherwise lacking project pages. The initial variation is thus quickly filtered

for projects that stand a greater chance of getting funded.

8. Conclusion

The prevalence of certain types of games that seem to ride on nostalgia hints that a demand for them exists that is not currently being satisfied by the market. Whether or not this is a failure by the publishing industry depends on what would be considered a success. If the industry is unaware of the demand, and chose to avoid such projects, it would a clear failure on their part to know their market. If they are aware, yet choose to avoid such projects, the issue gets more complicated. The publishers could avoid such projects in part due to having deemed their potential for profit too low, or because they deem them still too risky to invest in any significant amounts of money. From purely the point of view of the industry satisfying a demand, it could be argued that there is a failure on their part to provide games that are obviously in demand. The exact reasons behind this can be debated further, and would be purely conjecture due to requiring insider information from the companies involved. As far as the stated hypothesis is concerned, it can be concluded that there is a definite failure in the industry for satisfying certain avenues of demand for video games. Certain genres have not seen games released in them for many years, and many of the most successful projects for funding have been direct and indirect sequels to these genres. This strongly suggests a demand for such projects, and as their genres(or more specifically sub-genres) are not well represented in the industry releases, crowdfunding seems to be attempting to satisfy this ignored demand.

The second central issue of this assignment was to consider the idea of crowdfunding revitalizing the video game industry. This is a complex issue, as the phenomenon is still so very young. Currently there are several diverging points of view on this. There is no denying that crowdfunding has breathed new life into certain genres of games thought long gone, but for a few years it will remain uncertain whether the genres will be truly revitalized (and if further funding will be available). If such genres will continue to survive largely or in part by crowdfunding, it would be evident that at least in some genres, crowdfunding had indeed revitalized the industry. If the issue is approached from purely the point of view of innovation vs. stagnation, it is possible that some of the projects will be a “last hurrah”, before the genres they represent die out (Walker, 2012). On the other hand, it is possible that the genres that had died out, could continue development after being revitalized by a Kickstarter project or two, if they are shown to be in demand, and developers continue to work on them. There is certainly a large number of innovative Kickstarter projects too, although many are not successful. Those that are, rarely rely on well-known names or nostalgia, instead demonstrating unique gameplay or other ideas. The previously mentioned presentation values also apply, and few such projects can be found in the top 25, and more in the top 50 projects. They have been funded hence largely due to the novelty value, and this is something that has been considered Kickstarter’s strength. It remains to be seen if the

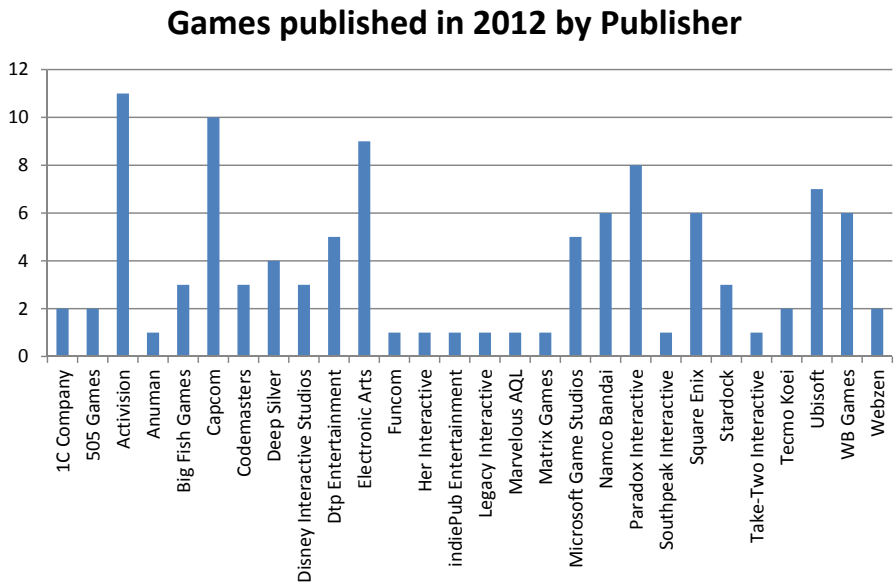
system has a long term ability to continue supporting such projects, and if people keep funding them. If things continue along the way they have for a couple years now, it is possible that Kickstarter and other crowdfunding sites will be significant, although perhaps not revolutionary. They could certainly make funding games easier for independent developers of smaller scale games in the long term, and contribute towards revitalizing that part of the industry. In regards to the hypothesis, it could be construed that short-term revitalization has certainly occurred, with the rise of many "extinct" genres back to the limelight, and the success of many risky and unique projects that would have been unlikely to receive funding through the traditional means. Any long-term confirmation of the hypothesis will have to wait several years, to see whether the current top projects are successes, and whether the retention part of the VSR-framework as it relates to crowdfunding will function as predicted.

The legitimacy issue was something central to whether a project is a success or not, and the mount of funding it would receive. Going back to figure 6, it can be seen that many of the most successful projects do exhibit significant legacy or the developers have a prior reputation. It is not something that is necessarily required, but considering how many of the most funded projects seem to have them, they have certainly helped with legitimizing the projects in the funders' eyes. It is not however necessary to have such leverage for creating a legitimate(to the funder) project, as many successful projects have achieved their goals without being able to rely on such legitimacy from prior experience or relation to prior games. In such cases strong pitch and a well-presented project page seem to legitimize a project sufficiently to the funders. The hypothesis of perceived legitimacy being crucial for success seems to have been confirmed by the ubiquitous adherence of successful projects to the features that enhance legitimacy, and the failure to do such being a common characteristic of failed projects.

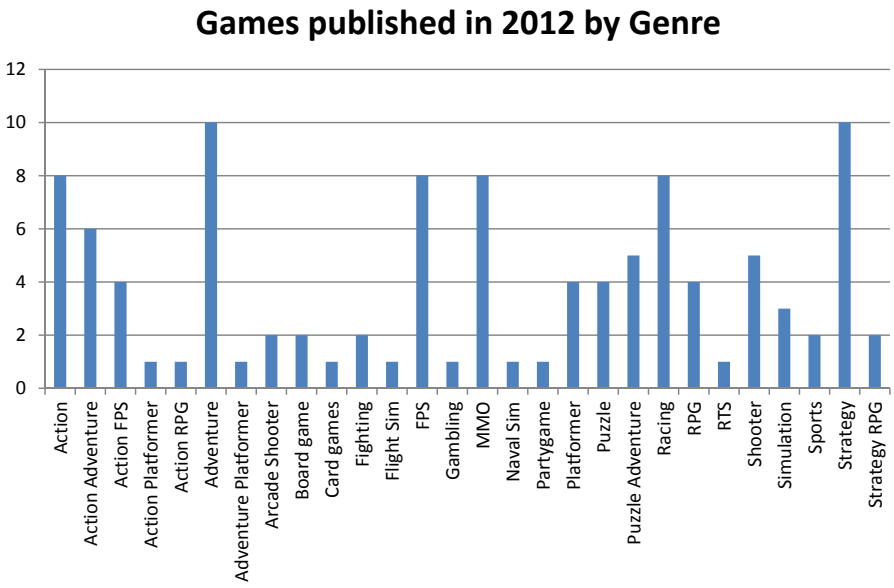
Appendices

Table 1. Established publishers of PC games currently in business that have published games in 2012

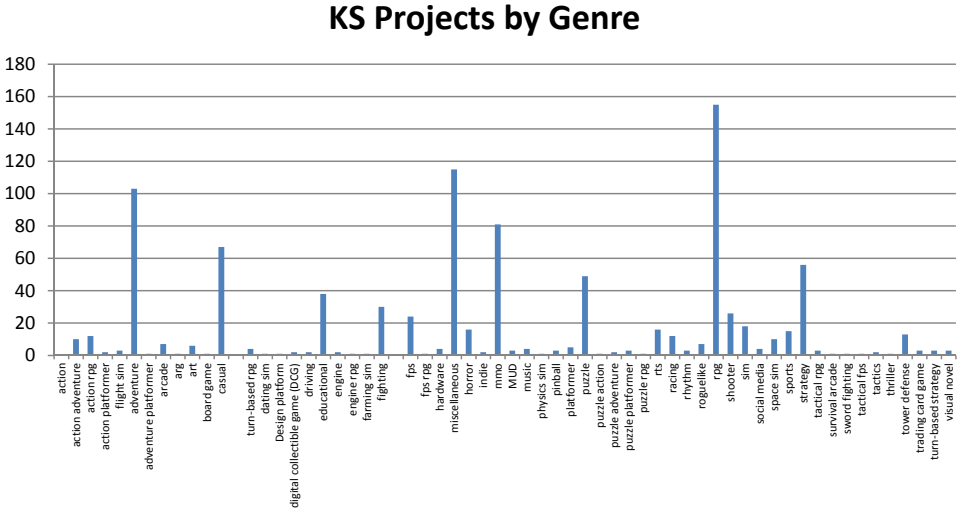
1C Company	Legacy Interactive
505 Games	Marvelous AQL
Activision	Matrix Games
Anuman	Microsoft Game Studios
Big Fish Games	Namco Bandai
Capcom	Paradox Interactive
Codemasters	Southpeak Interactive
Deep Silver	Square Enix
Disney Interactive Studios	Stardock
Dtp Entertainment	Take-Two Interactive
Electronic Arts	Tecmo Koei
Funcom	Ubisoft
Her Interactive	WB Games
indiePub Entertainment	Webzen



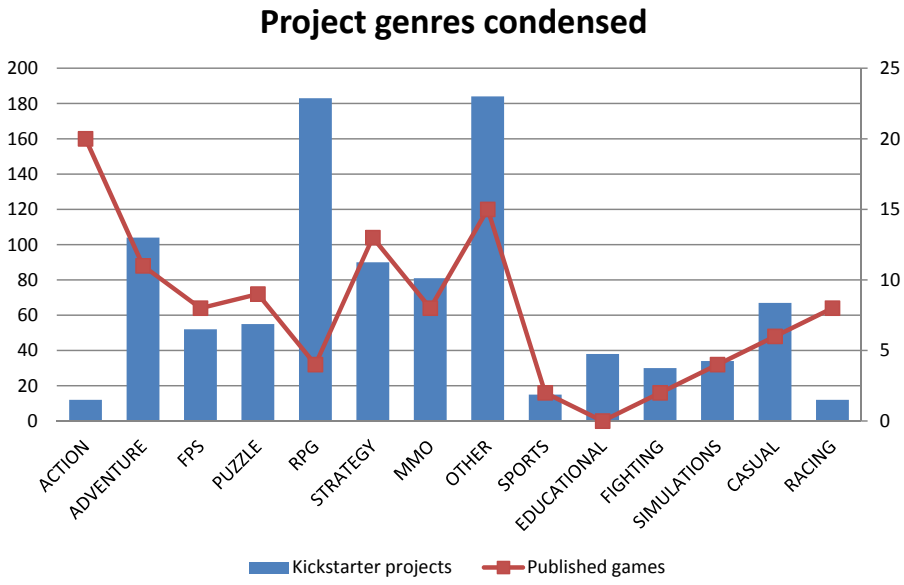
Graph 1



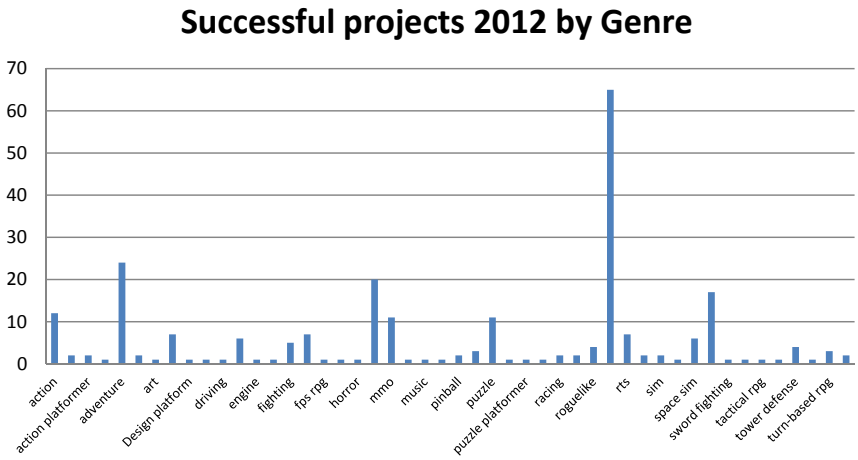
Graph 2



Graph 3



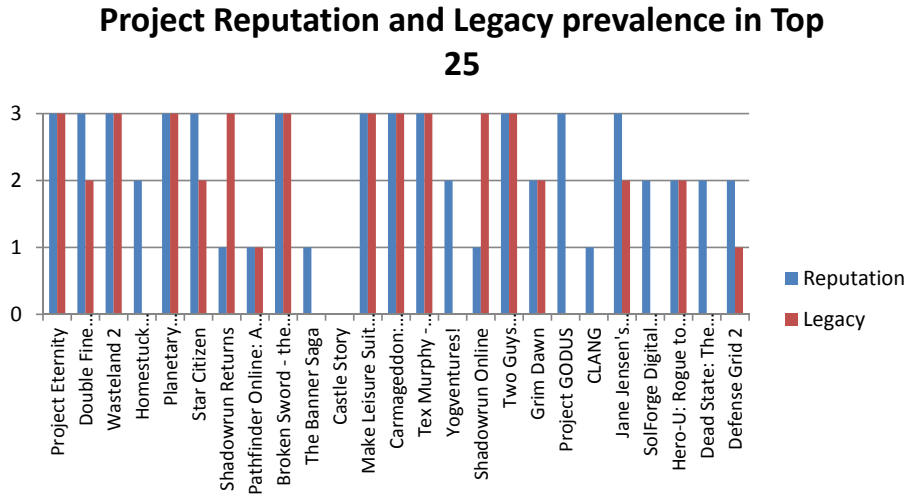
Graph 4



Graph 5

Table 2. Top 25 projects

	Funding(USD)	Genre
Project Eternity	3986794	rpg
Double Fine Adventure	3334203	adventure
Wasteland 2	2933197	rpg
Homestuck adventureGame	2485336	adventure
Planetary Annihilation – A Next Generation RTS	2228344	rts
Star Citizen	2134039	space sim
Shadowrun Returns	1836447	rpg
Pathfinder Online: A Fantasy Sandbox MMO	1091194	mmo
Broken Sword - the Serpent's Curse Adventure	771560	adventure
The Banner Saga	723886	strategy
Castle Story	702501	strategy
Make Leisure Suit Larry come again!	655182	adventure
Carmageddon: Reincarnation	625143	driving
Tex Murphy – Project Fedora	598104	adventure
Yogventures!	567634	action adventure
Shadowrun Online	558838	turn-based rpg
Two Guys SpaceVenture – by the creators of Space Quest	539767	adventure
Grim Dawn	537515	action rpg
Project GODUS	526563	strategy
CLANG	526115	sword fighting
Jane Jensen's Pinkerton Road 2012–2013 CSG	435316	adventure
SolForge Digital Trading Card Game	429715	digital collectible game (DCG)
Hero-U: Rogue to Redemption	409150	turn-based rpg
Dead State: The Zombie Survival RPG	332635	turn-based rpg
Defense Grid 2	271711	tower defense


Project Reputation and Legacy prevalence in Top 25
3
2
1
0
Project Eternity
Double Fine...
Wasteland 2
Homestuck...
Planetary...
Star Citizen
Shadowrun Returns
Pathfinder Online: A...
Broken Sword - the...
The Banner Saga
Castle Story
Make Leisure Suit...
Carmageddon:...
Tex Murphy -...
Yogventures!
Shadowrun Online
Two Guys...
Grim Dawn
Project GODUS
CLANG
Jane Jensen's...
SolForge Digital...
Hero-U: Rogue to...
Dead State: The...
Defense Grid 2
Reputation
Legacy

Graph 6

References

Baum, J. & Shipilov, A., 2006. Ecological approaches to organizations.. In: S. Clegg, C. Hardy, W. R. Nord & T. Lawrence, eds. *The Sage handbook of organizationstudies.* London: Sage Publications, pp. 55-110.

Bergen, J., 2012. *PCMag - Cool Kickstarter Projects.* [Online]
Available at: http://www.pcmag.com/slideshow_viewer/0,3253,l=294050&a=294050&po=1,00.asp
[Accessed 28 February 2013].

Clark, A., 2013. *Kicktraq.* [Online]
Available at: http://www.kicktraq.com/
[Accessed 2 March 2013].

FT, T., 2007. Balancing the tensions between rationalization and creativity in the video games industry. *Organization Science,* 18(6).

Giant Bomb, 2013. *List of Video Games - Giant Bomb.* [Online]
Available at: http://www.giantbomb.com/games/
[Accessed 15 March 2013].

Grayson, N., 2013. *Rock, Paper, Shotgun - Obsidian on Project Eternity, Kickstarter's future.* [Online]
Available at: http://www.rockpapershotgun.com/2013/02/16/obsidian-on-project-eternity-kickstarters-future/
[Accessed 1 March 2013].

Handrahan, M., 2012. *Games Industry International - Star Citizen: We'll compete with any AAA game out there.* [Online]
Available at: International; http://www.gamesindustry.biz/articles/2012-12-13-star-citizen-well-compete-with-any-aaa-game-out-there
[Accessed 2 March 2013].

Kain, E., 2012. *Forbes - Double Fine Adventure's Kickstarter Success Pumps New Life Into Crowd-Funded Gaming.* [Online] Available at: http://www.forbes.com/sites/erikkain/2012/11/27/elite-dangerous-spins-back-on-course-after-lackluster-kickstarter-start/
[Accessed 25 March 2013].

Mattsson, J. & Järvinen, J., Working paper. Specialize? Or Diversify? Or Both? Multidimensional Scope and Organizational Survival..

Parker, L., 2012. *Gamespot - Project Eternity closes with over $4.1m" in Gamespot.* [Online]
Available at: http://www.gamespot.com/news/project-eternity-closes-with-over-41m-6398388
[Accessed 12 March 2013].

Walker, J., 2012. *Rock, Paper, Shotgun - Kicking it old school: the peril of Kickstarter nostalgia.* [Online]
Available at: http://www.rockpapershotgun.com/2012/10/04/kicking-it-old-school-the-peril-of-kickstarter-nostalgia/
[Accessed 1 March 2013].

Walker, R., 2011. Dream Machine - The trivialities and transcendance of Kickstarter. *New York Times,* 7 August, p. MM32.

Weber, R., 2012. *Games Industry International - Avellone: It doesn't matter if Projet Eternity is a flop.* [Online]
Available at: http://www.gamesindustry.biz/articles/2012-12-03-avellone-it-doesnt-matter-if-project-eternity-is-a-flop
[Accessed 28 February 2013].

Wikipedia, 2013. *List of video game publishers - Wikipedia.* [Online]
Available at: http://en.wikipedia.org/wiki/List_of_video_game_publishers
[Accessed 28 February 2013].

Wikipedia, n.d. *Kickstarter - Wikipedia.* [Online]
Available at: http://en.wikipedia.org/wiki/Kickstarter
[Accessed 28 February 2013].

Aalto-ST 22/2013

ISBN 978-952-60-5348-6 (pdf)
ISSN-L 1799-4896
ISSN 1799-4896
ISSN 1799-490X (pdf)

Aalto University
School of Science
Industrial Engineering and Management
www.aalto.fi